

THE SYSTEMATICS OF THE FISHES OF THE FAMILY CLINIDAE IN SOUTH AFRICA

By

MARY-LOUISE PENRITH

South African Museum, Cape Town

(With 48 figures)

[MS. received 24 September 1967]

CONTENTS

	PAGE
Introduction	1
Relationships and classification of the family Clinidae	2
Systematics of the South African Clinidae	7
Origin of the South African Clinidae	105
Summary	115
Acknowledgements	115
References	116

INTRODUCTION

The family Clinidae includes the klipfishes, which are characteristic of the intertidal pools of the South African coast. Most of the common shore fish species of the Cape Province belong to this family, which is widely distributed, with endemic species in each region where it occurs. The relationships between the clinids of different parts of the world, their zoogeography and possible origins are important in indicating wider faunal relationships and paths along which faunal dispersal may have taken place.

The present work is a taxonomic revision of the South African Clinidae. The species were previously split into two groups. The species contained in one of the groups did appear to be more closely related to each other than to any of the species in the other group, but the second group seemed to be a heterogeneous assemblage of species with little in common. Furthermore, the characters used in defining numerous genera were such as sometimes to create difficulties in the placing of undescribed species. The generic arrangement proposed in the present work is based largely on external characters and may change, pending more detailed osteological studies. It was felt, however, that at this stage some rearrangement of previous classifications was necessary, and that a publication containing figures and uniform descriptions of all the species presently recognized, and all information known of the distribution of those species, would form a useful basis for future work.

Since 1962 the South African Museum has carried out intensive collecting of intertidal fishes from Moçamedes in southern Angola to Durban. This has supplied large quantities of material of the common species so that the extent of variability of characters in those species could be determined, and additional material of the rarer species has been collected. This has enabled me to examine fresh (as well as preserved) material of 28 of the 33 species of Clinidae described below.

RELATIONSHIPS AND CLASSIFICATION OF THE FAMILY CLINIDAE

The Clinidae are a family of blennioid fishes. The blennioid fishes have been defined by Gosline (1968) as perciform teleosts with the pelvic fins anterior to the pectorals, and the number of dorsal and posterior soft anal rays corresponding exactly with the number of vertebrae between them. The caudal fin is usually rounded.

The limits of the suborder Blennioidei have been subject to much change by systematists during the last century. The definitive recent work of Gosline (1968) has established the position of the Blennioidei among the perciform fishes, and the limits of the suborder. Other recent reviews of the classification of blennioid fishes have been published by Hubbs (1952), who revised the classification of tropical blennioids, and Makushok (1958), who revised the northern blennioids. The families at present recognized as constituting the suborder Blennioidei are listed in the comprehensive classification of fishes by Greenwood *et al.* (1966), and also by Gosline (1968).

Family **CLINIDAE**

Diagnosis. Small, weakly-swimming blennioid fishes. Body usually covered with cycloid scales. Suborbital bony ring weak and flexible. Jaw teeth conical and fixed, usually in more than one series; vomerine teeth usually present, and sometimes palatine teeth as well. Lateral line canals on head covered; lateral line running in upper half of body in front to behind pectoral fin, then curving down fairly sharply to mid-lateral position. Dorsal fin long, more or less continuous; first three spines may be separated to varying degree from rest of fin; more spinous than soft elements. Anal fin long and continuous, with two spines anteriorly. Pelvic fins with minute spine and two to four rays, jugular in position. Dorsal, anal, pectoral, and pelvic rays unbranched. Caudal rays branched or simple. Pseudobranchiae present. Gill membranes united, forming fold across throat. Branchiostegal rays six to seven on either side. An upturned, hook-like process on anterior border of cleithrum present or not.

Distribution. The Clinidae are distributed along both coasts of North, Central and South America, the West Indies, West Africa, South and South West Africa, Australia, New Zealand, the East Indies, Japan, the Philippines, and the Mediterranean. Their greatest representation is in America, the West

Indies and the temperate waters of South Africa and Australia. They generally occur in the intertidal zone of the shore or on coral reefs.

Relationships. The work of Hubbs (1952), Makushok (1958), Ford (1959), and Gosline (1968) confirms the close relationship of the Clinidae, Tripterygiidae, and Blenniidae. Their relationship with other perciform fishes is as yet undetermined (Gosline, 1968; Springer, 1968). The only clinid and blenniid fossils known are from the Mediterranean Miocene, during which period the genera known today were probably differentiated. Hubbs (1952) considered that the Blenniidae diverged early from the other families, since the absence of scales and the position of the eyes, well forward and high up in the head, indicate that they have specialized along different lines from the Clinidae and the Tripterygiidae, and presumably must have required a considerable amount of time to perfect these specializations. The fossil family Pterygocephalidae, known only from Eocene deposits, shows a mixture of percoid and blennioid features, and evidently represents a very early line, but Hubbs (1952) stated that the Pterygocephalidae show certain specializations that would remove them from the direct line of descent of any of the modern blennioids.

Both the Clinidae and the Tripterygiidae have retained more generalized features than the Blenniidae, but neither can be said with certainty to be more primitive than the other. The usually compressed body of the Clinidae is more typically percoid than the usually depressed body of the Tripterygiidae, but the Tripterygiidae retain more branched fin rays than do the Clinidae, in which branched caudal rays appear in only a few of the apparently most primitive members of the family. The Clinidae and the Tripterygiidae have more in common with each other than either family has with the Blenniidae, and in the vast majority of earlier works have been treated as a single family. However, Hubbs (1952), in his key to the families he included in a superfamily Blennioidae, gave some of the features on which the families can be separated, and they have been treated as separate by later workers, in particular Rosenblatt (e.g. 1963).

A fairly strong link between the Clinidae and the Blenniidae appears to be the family Chaenopsidae, which has long been of uncertain position in blennioid classification. It has usually been either partially or completely submerged in the Clinidae or the Blenniidae. Stephens (1963), revising the Chaenopsidae, gave them family status. Springer (1964), reviewing Stephens's work, was not entirely satisfied that the characters on which Stephens raised the Chaenopsidae to family status justified such an action. They have features in some ways intermediate between those of the Clinidae and those of the Blenniidae; they lack scales, but their affinities appear on the whole to lie more with the Clinidae than with the Blenniidae (Böhlke, 1957). Springer (1966) continued to treat them as a separate family in his discussion of *Medusablennius chani*, and they are listed as a separate family in the classifications of Greenwood *et al.* (1966) and Gosline (1968).

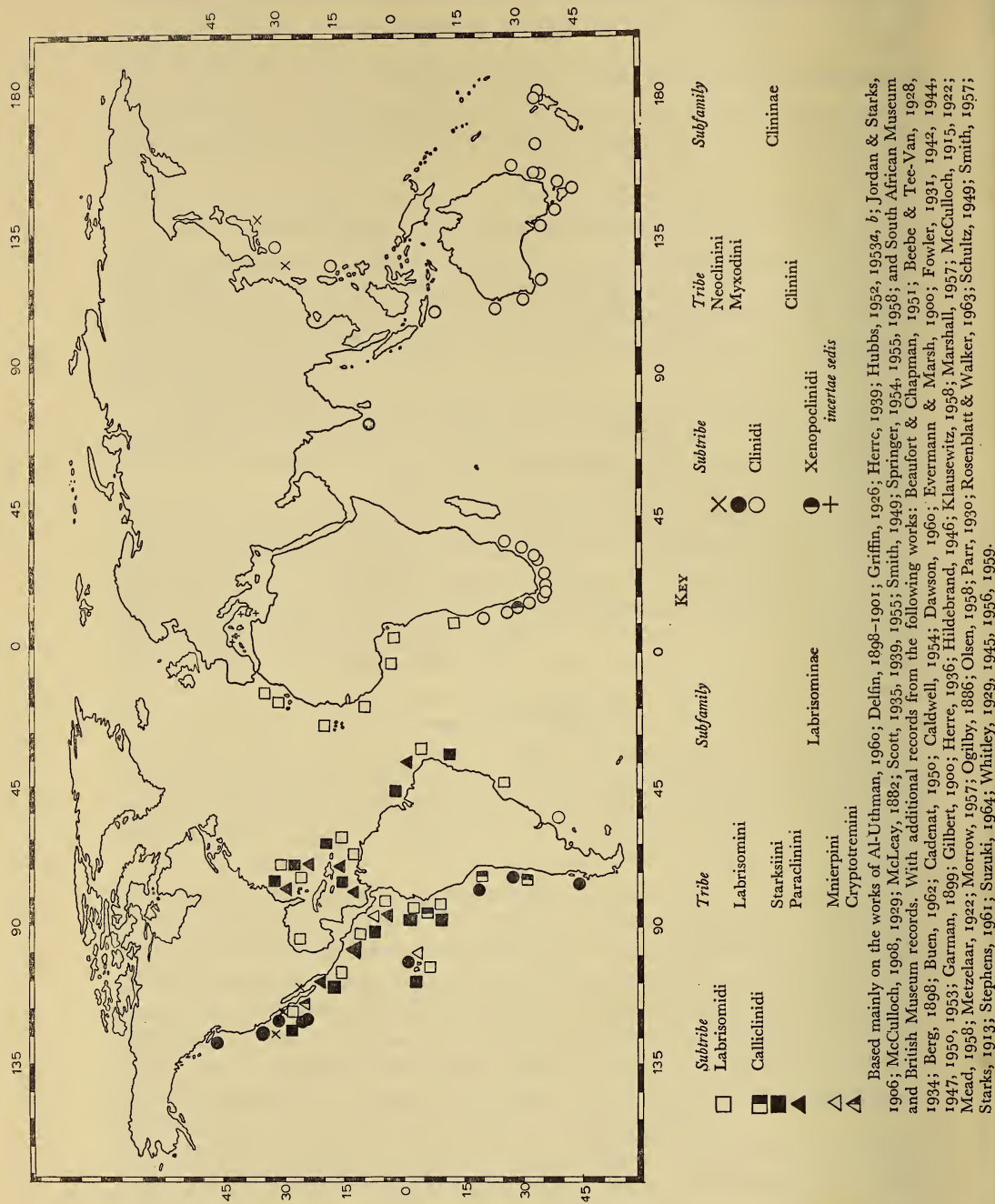


FIG. 1. World distribution of the tribes and subtribes of the family Clinidae.

Based mainly on the works of Al-Uthman, 1960; Delfin, 1898-1901; Griffin, 1926; Herrc, 1959; Hubbs, 1952, 1953a, b; Jordan & Starks, 1906; McCulloch, 1906, 1929; McLeay, 1882; Scott, 1935, 1939, 1955; Smith, 1949; Springer, 1954, 1955, 1958; and South African Museum and British Museum records. With additional records from the following works: Beaufort & Chapman, 1951; Beebe & Tee-Van, 1958, 1934; Berg, 1896; Buen, 1962; Cadenat, 1950; Caldwell, 1954; Dawson, 1960; Evermann & Marsh, 1900; Fowler, 1931, 1942, 1944, 1947, 1959, 1953; Garman, 1899; Gilbert, 1900; Herrc, 1936; Hildebrand, 1946; Klausewitz, 1958; Marshall, 1957; McCulloch, 1915, 1922; Mead, 1958; Metzelaar, 1922; Morrow, 1957; Ogilby, 1886; Olsen, 1958; Parr, 1930; Rosenblatt & Walker, 1963; Schultz, 1949; Smith, 1957; Starks, 1913; Stephens, 1961; Suzuki, 1964; Whitley, 1929, 1945, 1956, 1959.

The relationships within the family Clinidae are not by any means fully determined. Hubbs (1952) discussed the relationships of the South African and American Clinidae, but did not include the Australasian, Japanese, and Mediterranean clinids in his scheme of classification. He divided the Clinidae into two subfamilies, the Labrisominae and the Clininae. The Clininae are distinguished from the Labrisominae by the presence of an upturned hooklike process on the anterior border of the cleithrum. This process is absent in the vast majority of the Labrisominae, although in two labrisominid species, *Mala-coctenus erdmani* Smith and *M. aurolineatus* Smith, the hook is usually present in adults (Springer, 1958). The Clininae are further distinguished by the presence of radii on all scale margins. The scales are usually smaller than those of the Labrisominae (although exceptional genera without scales occur in both subfamilies), and the scales are often embedded in the skin.

The Labrisominae occur mainly in the tropical waters of both the Pacific and the Atlantic American coasts and the West Indies, one species occurs in Japan, and two species occur in tropical West Africa. The Clininae occur mainly in the temperate waters of the west coast of America, South Africa, and Australia, with a few representatives in New Zealand, two in Argentina, and one in Japan and the Philippines, and the East Indies.

Hubbs (1952) divided the Clininae into two tribes, the Clinidi and the Myxodidi. It should be noted here that Hubbs used the suffix -idi for tribes and the suffix -ini for subtribes, but in order to comply with the recommendation of the International Code for Zoological Nomenclature (1961), the process is reversed here and henceforth in the present work -ini will denote tribes and -idi will denote subtribes. Hubbs considered the Myxodini to be the more primitive group, since they are all oviparous, and the male lacks a penis for the transmission of sperm to the female. All the American Clininae belong to this tribe. The Clinini are distinguished by the presence in the male of a fleshy penis, and the fact that the young are born alive in at least all the species whose breeding habits are definitely known. All the South African clinids belong to the Clinini. Hubbs (1952) did not mention the Australian clinids and the Japanese cline in his system of classification. Milward (1967) recognized three genera of Clinidae from Australia, of which two, *Cristiceps* and *Petraites*, are represented in western Australia. Milward found all the western Australian species, at least, to be live-bearing and to have an intromittent organ in the male. The Australian Clinidae of the genera *Clinus*, *Petraites*, and *Cristiceps* are here included in the tribe Clinini. The Japanese species, *Petraites flammeus* (Jordan & Starks, 1906), is referable to the Clinini, as it has a well-marked hook on the cleithrum (Jordan & Starks, 1906), and a delicate intromittent organ in the male (Dr. V. G. Springer, pers. comm.). The classification of the family Clinidae is shown in table 1. Their world distribution is shown in figure 1.

Two of the known species of Clinidae do not fit into Hubbs's scheme of classification. *Clinitrachus argentatus* (Risso), the Mediterranean clinid, must for the time being be regarded as *incertae sedis*. It lacks a hooklike projection on the anterior border of the cleithrum, and is oviparous, the male lacking a penis.

TABLE 1. Classification of the family Clinidae (main arrangement after Hubbs, 1952, 1953*a*; naming of certain genera modified according to Springer, 1955, and Böhlke & Springer, 1961; classification of the tribe Clinini new).

Family: **CLINIDAE** Regan, 1912

Subfamily: **LABRISOMINAE** Hubbs, 1952

Tribe: **NEOCLININI** Hubbs, 1953

NEOCLINUS Girard, 1858

Tribe: **MNIERPINI** Hubbs, 1952

MNIERPES Jordan & Evermann, 1896;

DIALOMMUS Gilbert, 1891

Tribe: **PARACLININI** Hubbs, 1952

STATHMONOTUS Bean, 1885; *PARACLINUS* Mocquard, 1889;

EXERPES Jordan & Evermann, 1896.

Tribe: **STARKSIINI** Hubbs, 1952

STARKSIA Jordan & Evermann, 1896

Tribe: **CRYPTOTREMINI** Hubbs, 1952

ALLOCLINUS C.L. Hubbs, 1927; *CRYPTOTREMA* Gilbert, 1890.

Tribe: **LABRISOMINI** Hubbs, 1952

Subtribe: **CALLICLINIDI** Hubbs, 1952

AUCHENIONCHUS Gill, 1860; *CALLICLINUS* Gill, 1860;

MYERSICHTHYS Hubbs, 1952

Subtribe: **LABRISOMIDI** Hubbs, 1952

LABRISOMUS Swainson, 1839; *MALACOTENUS* Gill, 1860

Subfamily: **CLININAE** Gill, 1885

Tribe: **MYXODINI** Hubbs, 1952

MYXODES Cuvier, 1829; *HETEROSTICHUS* Girard, 1854; *GIBBONSIA*

Cooper, 1864.

Tribe: **CLININI** Hubbs, 1952

Subtribe: **CLINIDI** Hubbs, 1952

CLINUS Cuvier, 1817; *PAVOCLINUS* Smith, 1945; *CLINOPORUS*

Barnard, 1927; *GYNUTOCLINUS* Smith, 1945; *BLENNIO-*

CLINUS Gill, 1860; ?*PETRAITES* Ogilby, 1886; *CRISTICEPS*

Valenciennes *in* Cuvier & Valenciennes, 1836.

Subtribe: **XENOPOCLINIDI** Hubbs, 1952

XENOPOCLINUS Smith, 1947; *CANCELLOXUS* Smith, 1961.

Guiteil (1893) stated that although Valenciennes (*in* Cuvier & Valenciennes, 1836) believed that further examination of this species would result in the male being found to have a penis, his detailed examination of many specimens revealed no such structure, the anal papilla always being small. He described the breeding of this species in some detail; the female lays her eggs among the fronds of algae before they are fertilized by the male. By the present definition of the group, the lack of a hook on the cleithrum excludes it from either tribe of the Clininae, yet it more closely resembles the Clininae than the Labrisominae, particularly in the nature of the small embedded scales. It is possible that, during the long isolation of this species from other members of the Clininae, the hook on the cleithrum may have been secondarily lost; or that this species separated from the line leading to the Clininae before the hook had appeared.

Clinus nematopterus Günther was described from the Sea of China in 1861. Mr. A. Wheeler of the British Museum of Natural History has kindly examined the type for me. It fits into the Clininae, having small, embedded scales, a hook on the anterior border of the pectoral girdle, and a penis. It is known from a single specimen. Dr. V. G. Springer (pers. comm.) suggests that it is probably the same as the Japanese and Philippine clinids.

Of the three genera of Clinidae recognized in Australia (Milward, 1967), *Cristiceps* is a well-defined genus occurring mainly or only in the Australian region. Two Argentinian species of Clinidae, *eigenmanni* Jordan, 1887 and *argentinus* Berg, 1898, were placed in the genus *Cristiceps* by their original authors. The descriptions are both very brief, but various points in them suggest that these two South American species may not be referable to the same genus as the Australian *Cristiceps*. However, they are provisionally treated as Clinini in figure 1.

The Australian species of *Clinus* and *Petraites* that I have examined are externally at least very similar to one another and to the South African species of the genus *Clinus*. Both genera have been used for South African and Australian Clinidae. The validity of the genus *Petraites* is doubtful. Ogilby (1886) created the genus *Petraites* to contain certain Australian species. McCulloch (1908) said that *Petraites* cannot be clearly separated from *Clinus*, as there are several intermediate forms, but surprisingly went on to say that 'no good purpose can be served by uniting the two genera'. It seems unlikely that any good purpose is served by retaining as separate two genera that are difficult to distinguish from one another. However, a wider range of Australian material than has at present been available to me would be necessary to determine whether the genus *Clinus* should include both Australian and South African species, and whether there is any justification for retaining the genus *Petraites*. The Japanese *flammeus* may belong to an Australian genus or may warrant a genus of its own.

SYSTEMATICS OF THE SOUTH AFRICAN CLINIDAE

Material and methods. Most of this study is based on the clinid material in the South African Museum collection. The collection was considerably augmented

during my study by additions of fresh material collected on the coast from Swakopmund in South West Africa to Durban. Rotenone poison and hand-nets were used in the collection of samples. Details of material examined are given under the description of each species.

Where a syntype series is present in the South African Museum collection, a specimen in good condition and agreeing with the original description has been selected and designated as a lectotype.

Measurements were made with needle-point dividers as follows: Standard length (tip of snout to mid-base of caudal fin); head length (tip of snout to upper extremity of opercle); depth at anal origin; greatest diameter of orbit; length of upper jaw (inner edge of premaxilla to upper end of maxilla); length of caudal peduncle (base of last anal ray to mid-base of caudal fin); least depth of caudal peduncle; height of first dorsal spine; height of fourth dorsal spine; length of portion of fourth dorsal spine free from fin membrane. Head length was expressed as the number of times the head was contained in the standard length, as was body depth, and orbit diameter as the number of times it was contained in the head length, since these measurements were so expressed by

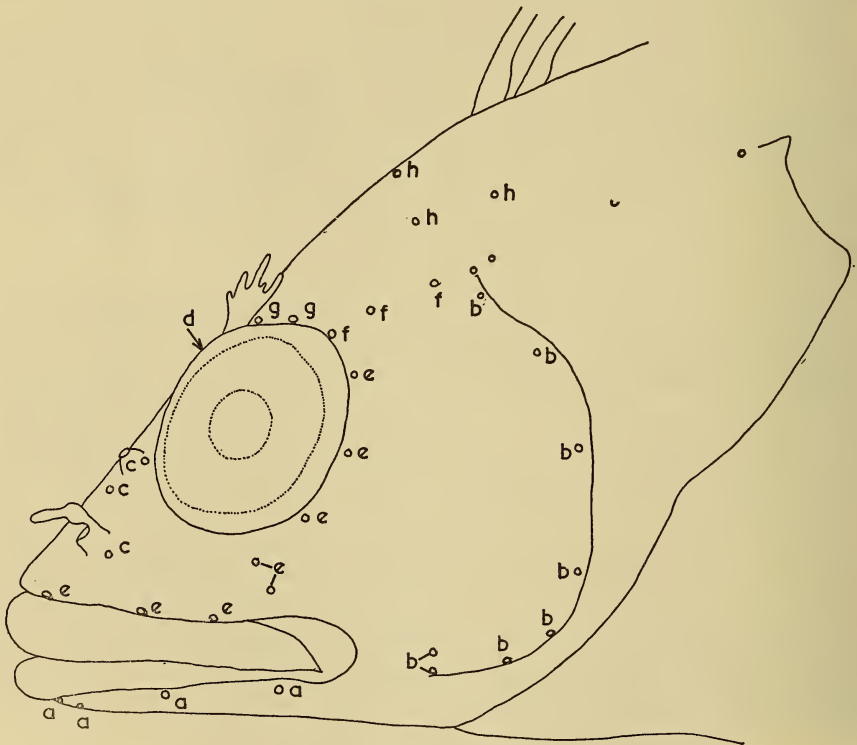


FIG. 2. Disposition of head pore series.

a = mandibular; b = preopercular; c = nasal; d = interorbital; e = suborbital;
f = postorbital; g = supraorbital; h = occipital.

previous authors; other measurements were expressed as percentage of standard length or of head length. Head length, body depth, orbit diameter, and caudal peduncle measurements are given under each description; other measurements are given where relevant. Counts were made of the number of spines and rays in the dorsal, anal, pectoral and pelvic fins, by the usual methods; all the fin rays in all South African Clinidae are undivided. Counts given in parentheses are modal counts. Vertebral counts of small samples of each species were made from X-ray photographs. Caudal vertebrae were taken to be those which had a haemal spine. Counts of the gill-rakers of the outer series on the first arch are given where possible. The disposition of the head pore series referred to is shown in figure 2.

Abbreviations used in the lists of material given at the end of each species description are S.A.M. (South African Museum) and R.U.C. (Department of Ichthyology, Rhodes University, Grahamstown).

The localities referred to in the distribution notes for each species are shown in a map, figure 48, placed at the end of the paper for easy reference.

Subfamily CLININAE Gill, 1885

Diagnosis. Clinidae with an upturned, hook-like process on the anterior edge of the cleithrum. Scales usually small and embedded, with radii on all margins. Caudal rays always unbranched. No nuchal cirri.

Tribe CLININI Hubbs, 1952

Diagnosis. Clininae which bear their young alive. Males with a fleshy penis. Always a cirrus above the anterior nostril. Body scales usually small and embedded, exceptionally absent. Hook on cleithrum usually well developed, rarely reduced or absent.

Subtribe CLINIDI Hubbs, 1952

Diagnosis. Clinini with head compressed, eyes lateral. Pelvic rays free from membrane for greater part of length. Hook on anterior border of cleithrum well developed.

Historical discussion of the classification of the South African Clinini

Various attempts have been made to classify the South African Clinini. Valenciennes (*in* Cuvier & Valenciennes, 1836), who described many of the species, placed all the South African species that he described, as well as *Blennius superciliosus* Linnaeus, in the genus *Clinus* Cuvier, with the exception of *capensis*, for which Cuvier (1817) had erected the genus *Cirrihibarbis*, distinguished from *Clinus* by the presence of barbels on the chin and snout.

Swainson (1839) erected various genera of Clinidae, besides recognizing Cuvier's genera *Clinus* and *Cirrihibarbis*. Besides those two genera, three of Swainson's genera (*Clinitrachus*, *Blennophis*, and *Labrisomus*) contained South

African species. He used body form and form of the dorsal fin (whether raised anteriorly to form a crest or not), as well as dentition, in the definition of his genera. He included two South African species, *latipennis* Valenciennes and *brachycephalus* Valenciennes (= *linearis* Swainson) in the genus *Labrisomus*, whose representatives are now included in a different subfamily from the South African forms (table 1).

Gill (1860) discussed Swainson's division of Cuvier's genus *Clinus*. He regarded *Clinus* and *Clinitrachus* as congeneric, as he considered the presence or absence of a dorsal crest to be insufficient grounds for generic separation, but *Blennophis* he considered valid. He removed from the genus *Labrisomus* most of the species placed in it by Swainson (1839), including *latipennis* and *brachycephalus*, erecting the genera *Ophthalmolophus* for the former and *Blennioclinus* for the latter. He stated that, while *latipennis* and *brachycephalus* were related, the former could be distinguished by the presence of supraorbital tentacles.

Swain (1882), in reviewing Swainson's (1839) work, followed Gill (1860) in synonymising *Clinitrachus* with *Clinus*, and considered *Blennophis* and *Labrisomus* to be subgenera of *Clinus*. He made little attempt to sort out exactly which species should be placed in each genus or subgenus, being chiefly concerned with the validity or otherwise of Swainson's proposed generic names.

The earlier South African workers, Gilchrist & Thompson (1908) and Barnard (1927), disregarded most of the clinid genera then available, and placed the majority of the South African species in the genus *Clinus* as defined by Cuvier (1817). Gilchrist & Thompson (1908) placed one species, *mentalis* Gilchrist & Thompson, in the genus *Cristiceps* Valenciennes on account of its completely separate dorsal crest. Several of the other species, notably *mus* Gilchrist & Thompson and *laurentii* Gilchrist & Thompson, also with completely separate dorsal crests and otherwise rather similar to *mentalis*, were retained in the genus *Clinus*. *Cristiceps* is an Australian genus with distinctive characters not found in any of the South African species. In their introductory discussion, Gilchrist & Thompson (1908: 98) also suggested that the generic name *Clinoides* be used for the non-crested species, but did not use the name in their systematic discussions.

Barnard (1927) transferred *mentalis* to another Australian genus, *Petraites* Ogilby, and with it *laurentii*, but *Petraites* is characterized by the presence of a supraorbital tentacle, lacking in both *mentalis* and *laurentii*. Barnard (1927) also described a new genus, *Clinoporus*, for *Clinus biporosus* Gilchrist & Thompson, which lacks scales and has a peculiar lateral line very different from that of the other clinids. In 1935 he described the species *navalis* and placed it in a new genus *Climacoporus*, based on lateral line differences.

Smith (1945) revised the South African Clinidae and divided the group into two subfamilies (Clininae and Myxodinae), distinguished only by the presence or absence of a supraorbital tentacle. Among the 15 genera, seven of them monospecific, which he recognized, nine were old genera: *Clinus*, *Cirrhobarbis*, *Blennophis*, *Ophthalmolophus*, *Petraites*, *Blennioclinus*, *Clinoporus*,

Climacoporus, and *Myxodes* Cuvier. Of these *Myxodes* had been used previously only for South American species; the inclusion in it by Smith of the South African live-bearing species *fuorum* Gilchrist & Thompson was later pointed out to be an error (Hubbs, 1952). In addition to the above genera, Smith described six new genera: *Muraenoclinus*, *Blenniominus*, *Fucomimus*, *Pavoclinus*, *Labroclinus*, and *Gynutoclinus*, four of which are monospecific.

Hubbs (1952), in a revision of the higher taxonomic categories of the Clinidae, accepted Smith's (1945) division of the South African species, but reduced Smith's subfamilies to the level of subtribes of the Clinini, which includes all the South African species (see table 1). Hubbs named them the 'Clinini' and the 'Blennioclinini', any form of the name *Myxodes* being unacceptable for South African species. He pointed out that the South African species *fuorum*, which Smith placed in the genus *Myxodes* on dental characters, could not be a *Myxodes* on account of the penis in the male and the fact that the young are born alive. Hubbs created a new genus, *Smithichthys*, for *fuorum*, revived Swainson's (1839) genus *Clinitrachus* for the species *superciliosus* Linnaeus and *robustus* Gilchrist & Thompson, and used the name *Clinus* for the species placed by Smith (1945) in the genus *Ophthalmolophus*. Apart from the changes in the nomenclature of the genera and the lowering of the two subfamilies to the status of subtribes, he did nothing to alter Smith's system of classification.

Smith (1966) pointed out that the genus *Clinitrachus* is applicable to the oviparous Mediterranean clinid *argentatus* Risso by type designation by Swainson (1839), and created a new genus, *Caboclinus*, for *superciliosus* and *robustus*.

From the above it can be seen that the only definitive attempt to group the South African Clinidae above the species level was Smith's (1945) revision. The major objection to this classification is his union of the non-tentacled species into one group. The genera *Blennioclinus*, *Gynutoclinus*, and *Clinoporus* have little in common with the other 'Blennioclinini' or with each other apart from the lack of a supraorbital tentacle in all except *Gynutoclinus*, which has a supraorbital papilla.

A potentially useful contribution to South African clinid taxonomy was made by Jackson (1950), but this unfortunately has remained unpublished, in thesis form. Jackson examined the South African Clinidae and concluded that to separate groups of species at a higher level than the generic one was incorrect. He placed the species with a supraorbital tentacle in one genus, *Clinus*, having the subgenera *Clinus*, *Blennophis*, *Petraites*, *Ophthalmolophus*, *Cirrhobarbis* and *Climacoporus*. Most of the species lacking a supraorbital tentacle he placed in another genus, *Myxodes* (this work was, of course, done prior to Hubbs' 1952 study), having subgenera *Myxodes*, *Blennioclinus* and *Labroclinus*. He left *Clinoporus* and *Gynutoclinus*, both monospecific and rare, with full generic value, mainly (he stated) owing to lack of material for study.

Jackson's scheme is one which, with several important modifications, appears to me to give a more valid interpretation of the evolutionary history of the group than any of the others. He distinguished his genera *Clinus* and

Myxodes on the presence or absence of a supraorbital tentacle and the relative size of the mouth. *Clinus* was defined as having a tentacle over the eye and a large mouth with powerful jaws, while *Myxodes* lacked a supraorbital tentacle and had a small mouth with weak, narrow jaws.

I have made measurements of the upper jaw of samples of all the South African species of Clinini, and the results are shown in a diagram (figure 3). The statistical method used in preparing the diagram was that described by Hubbs (1952); details of the method are given in the legend to the figure.

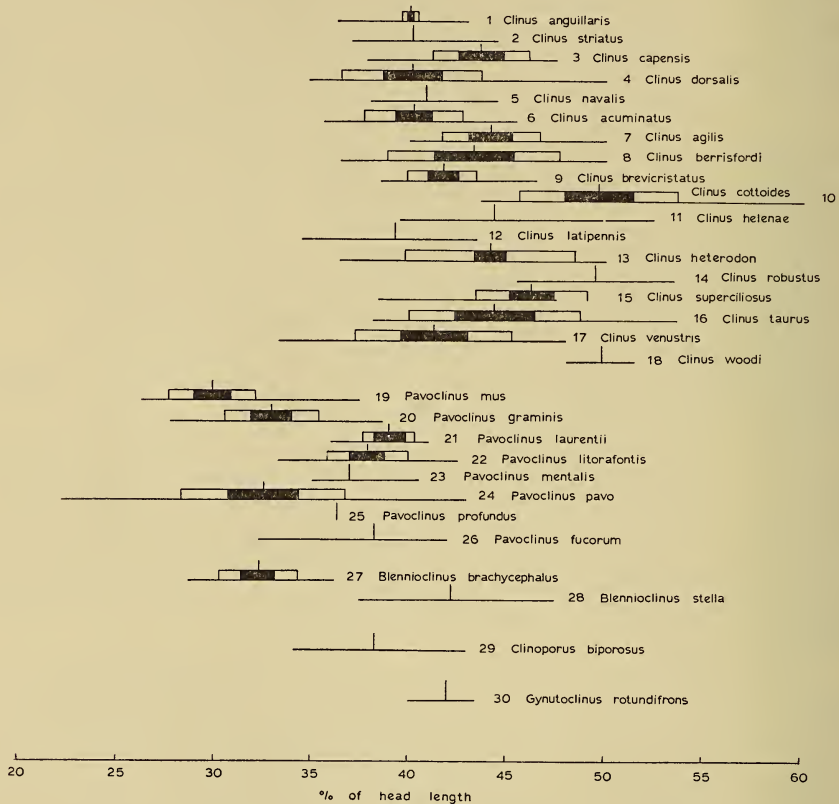


FIG. 3. Comparison of upper jaw lengths of the South African species of Clinini.

The method of representation is that used by Hubbs (1952) for comparative morphological studies. In each diagram the base line represents the range of measurements recorded for the sample, the upright line represents the mean, the open area represents the standard deviation on either side of the mean, and the solid area represents two standard errors on either side of the mean.

Samples of 25 specimens covering the full size range available were used where possible. Where fewer than 25 specimens were available, all specimens were used. For species of which fewer than 10 specimens were available, only the range and the mean are given. A full set of data is given in Appendix A.

- | | | | | | | | |
|----|---|----|----|----|----|----|----------------------|
| 3. | A minute, simple papilla over the eye | .. | .. | .. | .. | .. | <i>Gynotoclinus</i> |
| | A fringed or branched tentacle over the eye | .. | .. | .. | .. | .. | <i>Clinus</i> |
| 4. | Posteriormost dorsal spine much shorter than first dorsal soft ray; a deep notch in the margin of the dorsal fin before the soft rays | .. | .. | .. | .. | .. | <i>Blennioclinus</i> |
| | Posteriormost dorsal spine almost equal to first dorsal soft ray; no deep notch in the margin of the dorsal fin before the soft rays | .. | .. | .. | .. | .. | <i>Pavoclinus</i> |

Genus CLINUS Cuvier, 1817

- Clinus* Cuvier, 1817: 173 (type-species *Blennius acuminatus* Bloch & Schneider, by subsequent designation by Swainson, 1839: 75).
- Cirrhibarbis* Cuvier, 1817: 174 (type-species *Cirrhibarbis capensis* Valenciennes in Cuvier & Valenciennes, by monotypy).
- Blennophis* Swainson, 1839: 75 (type-species *Clinus anguillaris* Valenciennes in Cuvier & Valenciennes, by monotypy).
- Ophthalmolophus* Gill, 1860: 104 (type-species *Clinus latipennis* Valenciennes in Cuvier & Valenciennes, by monotypy).
- Climacoporus* Barnard, 1935: 646 (type-species *Climacoporus navalis* Barnard, by monotypy).
- Muraenoclinus* Smith, 1945: 538 (type-species *Clinus dorsalis* Castelnau, by monotypy).
- Blenniominus* Smith, 1945: 538 (type-species *Clinus taurus* Gilchrist & Thompson, by original designation).
- Caboclinus* Smith, 1966: 73 (type-species *Clinus robustus* Gilchrist & Thompson, by original designation).

Diagnosis. A distally flattened, at least bifid tentacle over eye. Lateral line usually of double pores and/or single pores opening above and below line anteriorly; posterior to post-pectoral curve usually of short separate horizontal tubes with a pore at either end. Intromittent organ of male usually consists of fairly long basal portion with small tip retractile between one or two pairs of fleshy lips. Body covered with small embedded cycloid scales. Two bands of villiform teeth in each jaw, outer row larger. Vomer always toothed. Upper jaw averages more than 40% head length. Body moderately robust. Caudal peduncle short.

Note on the type-species of Clinus

The problem of the type-species of *Clinus* is discussed by Hubbs (1952) and Smith (1966). *Blennius superciliosus* Linnaeus was generally regarded as the type-species of the genus, and was so designated by Swain (1882), because it is evident from the expanded description of the genus by Valenciennes (*in* Cuvier & Valenciennes, 1836) that the description was based chiefly on specimens of *superciliosus*. However, Swainson's (1839) arbitrary designation of *acuminatus* Bloch & Schneider as the type-species of *Clinus* must stand according to the rules of the International Code of Zoological Nomenclature (1961), Article 69(a)(iii).

Discussion

Most of the 18 species of the genus *Clinus* are small and occur almost exclusively in the intertidal zone; a few extend into deeper water, and a few reach a fairly large size (150–350 mm). Most species live in rock-pools among

TABLE 2. Comparison of the South African genera of Clinidi.

	<i>Clinus</i>	<i>Pavoclinus</i>	<i>Blennioclinus</i>	<i>Clinoporus</i>	<i>Gynatoclinus</i>
Characters					
Supraorbital tentacle	Distally flattened and branched	Absent	Absent	Absent	Minute, simple papilla
Scales	Small or minute, sometimes overlapping	Small or minute, often overlapping	Minute, not overlapping	Absent	Minute, not overlapping
Lateral line	Anterior pores often double; if single, opening above or below; posterior part usually of short horizontal tubes with pore at each end	Anterior pores single, opening medially or above and below; posterior part of short horizontal tubes with pore at each end	Anterior pores double; posterior part of short horizontal tubes with pore at each end.	Pores very large opening above or below irregularly throughout	Anterior pores single opening medially; posterior part of short horizontal tubes with pore at each end.
Intromitent organ	Basal part moderate to long; tip usually small, ensheathed or not	Basal part small to moderate; tip large, protruding	Basal part short to moderate; tip long, slender, ensheathed	Basal part long; tip small, not ensheathed	Basal part long; tip small, ensheathed
Upper jaw	Averages more than 40% head length	Averages less than 40% head length	30-45% head length	Less than 40% head length	More than 40% head length
Body form	Moderate to robust, sometimes eel-like	Moderate to highly compressed	Moderate	Robust, eel-like	Highly compressed
Clusters of cirri on dorsal spines	Often present	Absent	Present	Absent	Absent
Last dorsal spine/first dorsal ray	About equal	About equal	Much shorter	About equal	About equal
Translucent 'windows' in fin membranes	Usually absent	Present	Absent	Absent	Present
Caudal peduncle	Short	Moderate/long	Short	Short	Short
Mucus pores on head	Open flush or on papillae	Open flush	Open flush	Open flush	Open on papillae

stones and in crevices, although many species frequently hunt in sea-weeds as well, and one species habitually occurs in beds of the green alga *Caulerpa*; none, however, are particularly modified or coloured for weed-dwelling (see *Pavoclinus*). They are well camouflaged and able to change colour and pattern almost instantaneously, although there is generally a basic pattern of pigmentation that may last for a considerable time after preservation. This pattern may be of blotches or cross-bars, and there is almost invariably an ocellate spot on the shoulder, anterior fin spines, or opercle. The species are entirely carnivorous, but the diet is very varied, both between and within species. There is a tendency in many species to develop a notch in the membrane joining the third and fourth dorsal spines. The first three dorsal spines are often elevated to form a crest; this is considered to be a primitive feature in the family Clinidae (Hubbs, 1953b). In *C. superciliosus*, which has a very well developed crest, the height of the crest shows sexual dimorphism. The other species show little or no sexual dimorphism other than the development of a penis in the male.

An examination of the gonads of many individuals of several species of this genus suggests that, while parasitism of the ovaries by trematodes occurs to a varying degree, the testes of the males are normally not affected.

Jackson (1950) divided *Clinus* into subgenera which, with one exception, corresponded with Smith's (1945) genera. In attempting to group the 18 species contained in the genus *Clinus* as defined above, one is confronted with the difficulty of deciding on a method that will reflect the natural relationships of the species within the genus. This is a problem, because there is an indication of development along at least two major and several minor lines within the genus. Most of the species form a more or less generalized group in which each minor line of development is represented by a range rather than a cluster of species.

It is proposed to use five subgenera, one of which contains a large number of generalized species. The other four are believed to represent particular lines of development and are easily defined; they appear to be more closely related to each other than to the more generalized species.

Clinus navalis, *C. dorsalis*, *C. anguillaris*, *C. striatus*, and *C. capensis*, previously distributed among the genera *Climacoporus*, *Muraenoclinus*, *Blennophis*, and *Cirrhibarbis* are all rather elongate, eel-like species. Smith (1945) separated them from each other generically for the following reasons: (1) *Clinus navalis* has only one dorsal soft ray, and the lateral line pores are double for most of the length of the line, sometimes the whole length; it was placed in the genus *Climacoporus* by Barnard (1935) and retained in that genus by Smith (1945). (2) *C. dorsalis* has only one dorsal soft ray, and the lateral line is of the usual type posterior to the post-pectoral curve (i.e. of short horizontal tubes with a pore at either end); Smith (1945) placed it alone in the genus *Muraenoclinus*. (3) *C. anguillaris* and *C. striatus* have 2-4 dorsal soft rays and scaly cheeks, and were placed in the genus *Blennophis*. (4) *C. capensis* has barbels on the chin and snout, and scaly cheeks, and was placed in the genus *Cirrhibarbis*.

C. anguillaris and *C. striatus* are the two most eel-like species. They have small scales on the cheeks as well as on the bases of the dorsal, anal and caudal fins. They are very alike and form a distinct pair of species; it is proposed to show their relationship by placing them together in a subgenus *Blennophis*.

C. capensis cannot be confused with any other species, on account of the barbels on the chin and snout. In some families, e.g. Brotulidae, this feature is considered sufficient grounds for generic distinction. Springer (1954) included one species with a chin barbel in the clinid genus *Paraclinus*, whose members are otherwise without facial barbels. In view of the fact that *C. capensis* resembles

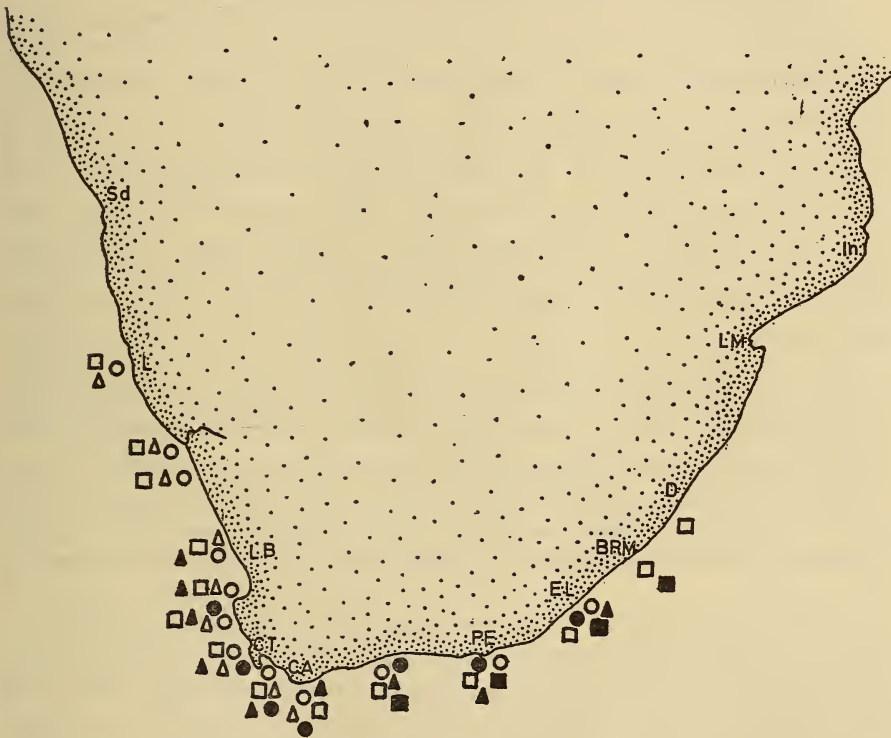


FIG. 4. Distribution of *C. anguillaris* (open circles), *C. striatus* (closed circles), *C. capensis* (closed triangles), *C. dorsalis* (open squares), *C. navalis* (closed squares), *C. acuminatus* (open triangles).

the other species of *Clinus* in all other respects, having the same type of supra-orbital tentacle, lateral line, and intromittent organ, it seems preferable to treat this species as a member of the genus *Clinus*. Since, however, it is set apart from the others by the facial barbels, it may be placed in a subgenus *Cirrhibarbis*.

The lateral line of *C. navalis* appears to be of the same type as that found in the other species of *Clinus*, but the pores continue double for a varying distance behind the post-pectoral curve, often along the whole length of the lateral line.

As in *C. dorsalis*, there is one soft ray in the dorsal fin, and the cheeks are naked, as in the majority of species. The supraorbital tentacle is similar in *C. navalis* and *C. dorsalis*. It is very difficult to distinguish between juvenile specimens of these two species except on fin counts. However, since *C. dorsalis* differs from *C. navalis* in being a far more elongate species, with 19 precaudal vertebrae as opposed to 15 in *C. navalis*, and has virtually all the sensory pores of the head and lateral line system single, while in *C. navalis* most of the sensory pores are double, and finally, in view of the unusual form of the intromittent organ in *C. navalis*, *Muraenoclinus* and *Climacoporus* are maintained as subgenera.

The remaining 13 species constitute the subgenus *Clinus*.

C. taurus and *C. cottoides* were placed in a genus *Blenniomimus* by Smith (1945) because both species have a bony ridge over the eye, which makes the interorbital appear concave instead of flat. The ridge is by no means striking in small specimens of *C. cottoides*; and it is slightly developed in *C. latipennis* and *C. helenae*, which Smith placed in the genus *Ophthalmolophus*. *C. taurus* and *C. cottoides* should therefore not be separated generically or even subgenerically from the other species, since they, particularly *C. taurus*, represent the extreme of the range of development of a particular feature. The bony ridge is furthermore a feature which in some species becomes more pronounced with age; in *C. heterodon* there is no sign of a ridge in small specimens, but it may be very pronounced in large ones.

C. superciliosus, *C. robustus*, *C. brevicristatus* and *C. woodi* were previously separated from the other tentacled species because the first three dorsal spines were higher than the succeeding ones, forming a crest. *C. superciliosus* and *C. robustus* were placed in the genus *Clinus* in a restricted sense, because they have a notch in the membrane between the third and fourth dorsal spines less than 50% of the height of the fourth spine. The two species were subsequently transferred first to *Clinitrachus*, by Hubbs (1952), and then to *Caboclinus*, by Smith (1966).

C. brevicristatus and *C. woodi* were placed in the genus *Petraites*. Species of this genus have a notch in the fin membrane between the third and fourth dorsal spines more than 50% of the length of the fourth spine (McCulloch, 1908), although Smith (1945) stated that the notch is complete in *Petraites*, and the membrane from the third spine barely reaches the base of the fourth spine. McCulloch (1908) stated that the two genera *Clinus* and *Petraites* are barely distinguishable from one another, and this is certainly true of the South African species involved, since *C. superciliosus* resembles *C. woodi* more closely than it does *C. robustus*, and *C. brevicristatus* is as close to forms such as *C. agilis*, *C. venustris*, and *C. cottoides* as it is to *C. woodi*. In *C. superciliosus* the depth of the notch varies from 0–100% of the fourth spine, but is generally 40–60% (see table 3). *C. robustus* has an extremely shallow notch. In *C. woodi* the membrane from the third spine barely reaches the base of the fourth spine. In *C. brevicristatus* the notch varies from 25–100% of the fourth spine but is usually 50–75%, and only rarely 100%. The crest is high and triangular in *C. woodi* and

particularly in mature male specimens of *C. superciliosus*, and is very low, scarcely elevated, in *C. robustus* and *C. brevicristatus*. Among the other species, *C. agilis* and *C. taurus* have a notch in the membrane between the third and fourth spines but the first three spines are not elevated, and *C. venustris* often has the second and third dorsal spines somewhat elevated. There is a range of crest and notch development in this genus, and it is thus impossible to base generic distinctions on these features. It is often difficult to decide whether individual specimens of *C. robustus* and *C. brevicristatus* have a crest at all, while in other individuals it is quite marked. It is also possible that the crest has been developed or reduced separately in the various species, and that its presence does not indicate close affinity. There are no other features to suggest a closer affinity amongst all the crested species than amongst crested and non-crested species.

The five species previously contained in the genus *Ophthalmolophus* were apparently placed there because they lacked any of the structures that distinguished the other genera, although in fact indications of those structures appear in the various members of this group of species. As noted above, *C. latipennis* and *C. helenae* show signs of a bony ridge over the eye, and may in that feature represent stages approaching the condition seen in *C. taurus* and *C. cottoides*, so that the classification should in some way relate these species. *C. agilis*, with a notch between the third and fourth dorsal spines, is too similar to *C. brevicristatus* on the one hand, with a deeper notch and the first three dorsal spines slightly elevated, and to species such as *C. acuminatus* on the other hand, with no notch or crest, to be separated even subgenerically from either. *C. venustris* shows rudiments of a crest (the second and third dorsal spines are sometimes higher than the others), but this is not sufficiently marked in every individual for the species to be defined as having a crest. Apart from these variations of the dorsal fin, the 13 species placed in the subgenus *Clinus* are united by so many common features and are often so hard to distinguish from one another that any attempt at separation into subgenera would be unwarranted.

I believe that while the subgenera used do represent different lines of evolution within the genus *Clinus*, the species contained in the genus as a whole form a well-defined group that are more closely related to each other than to any other clinid species. However, should another worker wish to separate the eel-like subgenera *Blennophis*, *Cirrhobarbis*, *Muraenoclinus* and *Climacoporus* from the subgenus *Clinus* and place them in a separate genus or separate genera, there would be little reason for serious objection to such an arrangement.

Distribution of the genus Clinus

In South Africa *Clinus* occurs in temperate waters. Three species (*C. navalis*, *C. helenae*, *C. woodi*) are confined to the waters north-east of Cape Agulhas; most of the species are restricted to the coast south of the Kei River (figs 4, 11, 19). Only one species (*C. woodi*) is known to extend north of Durban to Inhambane, where it is rare, and it does not reach the tropical waters north of that point. On the north-west coast, two species (*C. superciliosus* and *C. heterodon*) extend

into the tropics north of Walvis Bay, but as the coast in that region is under the influence of the cold Benguela current, conditions of water temperature and fauna are not markedly tropical. The genus *Clinus* includes all the common species of the Cape coast west of the Cape Peninsula. Twelve of the 18 species have been recorded from the waters west of Cape Point, only one of these (*C. cottoides*) being common north-east of Algoa Bay. The other five species are fairly rare throughout the South African coastal region. It seems that this genus has its greatest distribution in the colder regions of the South African coast.

Range. Rocky Point (18°59'S., 12°29'E) (South West Africa) to Inhambane (23°51'S., 35°29'E) (Mozambique).

Key to the subgenera of Clinus

- | | | |
|----|--|-------------------------------|
| 1. | Scales on the cheeks | 2 |
| | No scales on the cheeks | 3 |
| 2. | Barbels on chin and snout | <i>Cirrhibarbis</i> |
| | | (1 species, <i>capensis</i>) |
| | No barbels on chin or snout | <i>Blennophis</i> |
| | | (2 species) |
| 3. | One dorsal soft ray | 4 |
| | More than one dorsal soft ray | <i>Clinus</i> |
| | | (13 species) |
| 4. | More than 40 dorsal spines; most sensory pores single | <i>Muraenoclinus</i> |
| | | (1 species, <i>dorsalis</i>) |
| | Fewer than 40 dorsal spines; most sensory pores double | <i>Climacoporus</i> |
| | | (1 species, <i>navalis</i>) |

Subgenus *Blennophis* Swainson, 1839

Blennophis Swainson, 1839: 75 (type-species *Clinus anguillaris* Valenciennes in Cuvier & Valenciennes)

Diagnosis. Elongate eel-like clinids with small scales on cheek and dorsal, anal and caudal fin bases, as well as over general body surface. Body robust. Dorsal fin low, even. No cirri at dorsal spine tips. No barbels on chin or snout. Dorsal soft rays 2-4.

Remarks. Two species, one common only west of Cape Point, the other rare throughout its range, but encountered more frequently east of Cape Point. Both reach a large size and occur infratidally as well as in intertidal rock pools.

Key to the species of Blennophis

- | | | |
|----|--|---|
| 1. | Inner pelvic ray stout, equal in length to other two; dorsal spines 46 or more, anal rays 33 or more | <i>Clinus</i> |
| | | (<i>Blennophis</i>) <i>anguillaris</i> |
| | Inner (third) pelvic ray minute or absent; dorsal spines 45 or fewer, anal rays 31 or fewer | <i>Clinus</i> (<i>Blennophis</i>) <i>striatus</i> |

TABLE 3. Depth of notch in membrane between third and fourth dorsal spines (expressed as % of fourth dorsal spine free from membrane).
The numbers represent number of specimens from each sample having a particular depth of notch.

Species	0-9%	10-19%	20-29%	30-39%	40-49%	50-59%	60-69%	70-79%	80-89%	90-99%	100%
<i>Clinus superciliosus</i>	3	0	3	12	15	40	57	19	16	2	7
<i>Clinus woodi</i>	0	0	0	0	0	0	0	0	0	0	5
<i>Clinus robustus</i>	1	0	2	2	1	1	0	0	0	0	0
<i>Clinus brevicristatus</i>	0	0	1	0	2	2	7	4	7	0	4
<i>Clinus agilis</i>	4	1	1	9	3	32	34	7	9	0	0
<i>Clinus taurus</i>	0	0	0	1	1	0	8	4	1	0	0

Clinus (Blennophis) anguillaris Valenciennes in
Cuvier & Valenciennes, 1836
(Fig. 5)

Blennius rubescens Lichtenstein, 1823: 117 (*nomen oblitum*).

Clinus anguillaris Valenciennes in Cuvier & Valenciennes, 1836: 390. Gilchrist & Thompson, 1908: 133. Barnard, 1927: 862.

Blennophis anguillaris: Swainson, 1839: 75. Smith, 1945: 539, 1949: 352, pl. 78 fig. 980.

Blennophis rubescens: Smith, 1962: 40.

Description. D. XLVI-L (XLVIII-L) 2-4 (3-4); A. II 33-37; P. 13-14 (13); V. I 3; C. 13. Gill-rakers in outer series on first arch 2-3 + 5-7. Vertebrae 18 + 38-40. Dorsal fin long, low, even. No clusters of cirri on dorsal spine tips. Pectoral fin rounded. Inner pelvic ray well developed, stout, equal to others. Caudal peduncle very short, length 15.5-25% head length, depth 28.5-35.5% head length. Caudal fin short, sub-truncate.

Body elongate, robust, eel-like, with small embedded scales extending on to caudal, dorsal, and anal fin bases, upper edge of opercle, and cheeks. Depth 6-7.75 in standard length. Head bluntly wedge-shaped, 4.75-5.75 in standard length. Eye 3.25-5 in head, relative size of eye decreasing with increase in

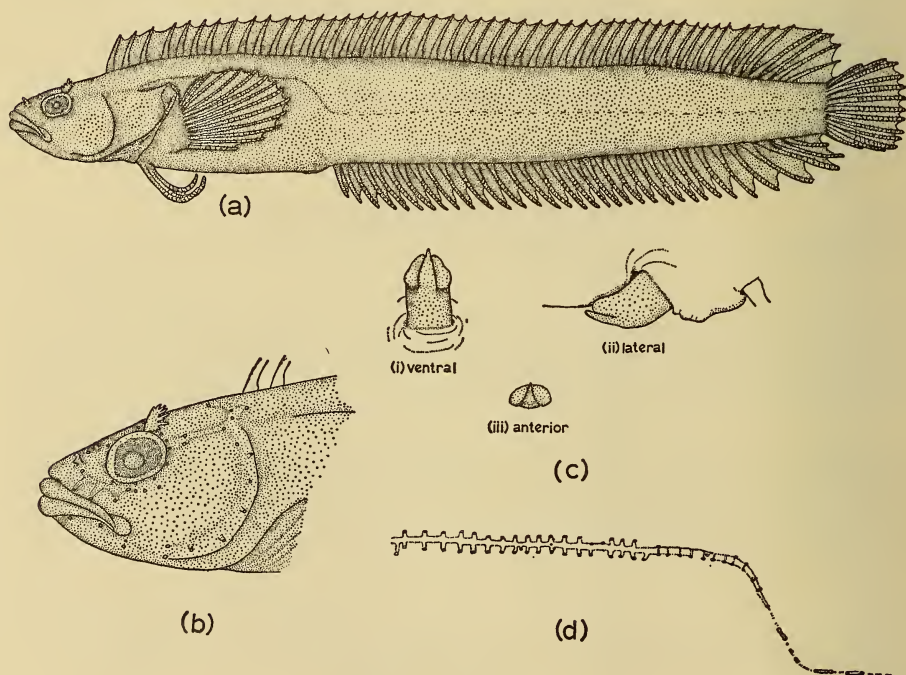


FIG. 5. *Clinus (Blennophis) anguillaris*: (a) Lateral view, male, 99 mm, S.A.M. 24206; (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

standard length of fish. Orbital tentacle prominent, with flat stalk and fine fringe of cirri at tip. Cirrus on anterior nostril elongate, simple, with serrated edges. Upper jaw 38–42.5% head length. Lips thick. Vomer toothed. Sensory pores of head single in nasal, interorbital, occipital and supraorbital series, mainly single in mandibular and preopercular series, first pore of mandibular and last pore of preopercular series double; postorbital and suborbital series mostly of paired pores (fig. 5 (b)).

Lateral line mostly of vertical pairs of pores in front to post-pectoral curve, then of short separate horizontal tubes with pore at either end (fig. 5 (d)). Intromittent organ of male with moderate basal portion and single pair of oval dorso-lateral lips (fig. 5 (c)).

Colouring. Variable, reddish to dark maroon, or pink with reddish blotches. Fins red- or white-tipped. Sometimes light-edged, dark ocellus on shoulder, always present in juveniles. Often two dark radiating bars from eye across cheek. Snout white in large, dark-red specimens. Plain buff or pinkish preserved in alcohol.

Location of type material. Muséum National d'Histoire Naturelle, Paris.

Material examined. 36 specimens, 65–278 mm in standard length. 2 from 'Rade du Cap', Paris Museum Cat. Nos. A. 2079 & 6341 (syntypes); 11 from Lüderitzbucht, S.A.M. 24208; 1 from Gert du Toit Bay, southern Namaqualand, S.A.M. 24019; 4 from Doring Bay, southern Namaqualand, S.A.M. 24020; 2 from Lambert's Bay, S.A.M. 23887, S.A.M. 24010; 1 from Kommetjie, Cape Peninsula, S.A.M. 23874; 9 from St. James, False Bay, S.A.M. 10526, S.A.M. 13721; 2 from Dalebrook, False Bay, S.A.M. 21538, S.A.M. 21539; 1 from Still Bay, S.A.M. 25059; 1 from East London, S.A.M. 19745; 2, no locality, S.A.M. 21708, S.A.M. 21709.

Remarks. The scales on the head in this and the related species, *Clinus (Blennophis) striatus*, might possibly be primitive characters, as also the degree of development of the inner pelvic ray of *C. anguillaris*.

Nomenclature. Smith (1962) pointed out that Lichtenstein's (1823) description of *Blennius rubescens* from the Cape of Good Hope fits *Clinus anguillaris*. However, the name *anguillaris* has been used for the present species since 1836, while Lichtenstein's name had not been used for well over a hundred years until Smith revived it in 1962. According to the International Code of Zoological Nomenclature (1961), Article 23(b), unless the International Commission should decide otherwise, 'a name that has remained unused as a senior synonym in the primary zoological literature for more than fifty years is considered to be a forgotten name (*nomen oblitum*)'. Forgotten names may not be used unless the Commission so directs. Smith (1962) did not place the matter before the Commission. The name *anguillaris* Valenciennes in Cuvier & Valenciennes, 1836, is thus retained for this species.

Distribution (fig. 4). The known range is Lüderitzbucht (26°38'S., 15°10'E) (South West Africa) to East London (33°00'S., 27°54'E). Fairly common on

the west coast as far south as Lambert's Bay, becoming rather rare east of Cape Point. Small specimens occur under stones in shallow pools near the top of the shore, but larger specimens occur only at the bottom of the shore, and extend into the sublittoral fringe. The species blends perfectly with the stipes of kelp among which it occurs.

Clinus (Blennophis) striatus Gilchrist & Thompson, 1908
(Fig. 6)

Clinus striatus Gilchrist & Thompson, 1908: 134. Barnard, 1927: 862.
Blennophis striatus: Smith, 1945: 539, 1949: 353, fig. 981.

Description. D. XL–XLV 2–4 (2–3); A. II 28–31 (30–31); P. 12–13 (13); V. I 2–3; C. 13. Gillrakers in outer series on first arch 2–3 + 7–8. Vertebrae 17 + 34–35. Dorsal fin long, low, even. No clusters of cirri at tips of dorsal spines. Pectoral fin rounded. Inner pelvic ray reduced or absent. Caudal peduncle very short, length 10–20% head length, depth 23–27% head length. Caudal fin short, subtruncate.

Body elongate, robust, eel-like, with small embedded scales extending on to caudal, dorsal and anal fin bases, upper edge of opercle, and cheeks. Depth 6–8·25 in standard length. Head bluntly wedge-shaped, 4·5–5·25 in standard length. Eye 3·5–5 in head. Supraorbital tentacle prominent, with flat stalk and fringe of fine cirri at tip. Cirrus on anterior nostril elongate, spatulate, and slightly lobed ventrally. Upper jaw 37–44·5% head length. Lips thick. Vomer toothed. Sensory pores of head single in nasal and interorbital series; mainly single in mandibular and preopercular series, first mandibular and last preopercular pore paired. Pores of other series double. Multiple pore in postorbital series (fig. 6(b)).

Lateral line as in *Clinus anguillaris*, mainly of vertical pairs of pores opening above and below line in front to post-pectoral curve, then of short, separate horizontal tubes with pore at either end (fig. 6(d)). Intromittent organ of male with moderate basal portion and single pair of narrow, crescentic dorso-lateral lips (fig. 6(c)).

Colouring. Pink with brownish-red to dark-red mottling, fins usually reddish. Adults occasionally have faint white longitudinal stripes. Light-edged dark ocellus on shoulder. Two dark radiating lines from eye across cheek. Juveniles white with longitudinal black stripes. Uniform buff to pinkish preserved in alcohol.

Location of type material. South African Museum, Cape Town.

Lectotype. Female, 142 mm standard length, Simon's Bay, False Bay, S.A.M. 25239.

Material examined. 11 specimens, 42–145·5 mm in standard length. 1 from Saldanha Bay, S.A.M. 23878; 3 from Simon's Bay, False Bay, S.A.M. 25239 (lectotype), S.A.M. 10527 (paralectotypes), 2 from Kalk Bay, False Bay,

S.A.M. 17844, S.A.M. 18086; 3 from Strandfontein, False Bay, S.A.M. 24240; 2, no locality, S.A.M. 21710, S.A.M. 21796.

Remarks. This species is very similar to *Clinus anguillaris*, differing from it externally only in the fin counts, in the degree of reduction of the inner pelvic ray and in the greater number of double sensory pores on the head.

Distribution (fig. 4). The known range is from Saldanha Bay ($33^{\circ}00'S.$, $17^{\circ}56'E$) to East London ($33^{\circ}00'S.$, $27^{\circ}54'E$). The juveniles occur high up on the shore, but larger specimens are taken at the bottom of the shore and infratidally, among kelp stipes. Rare.

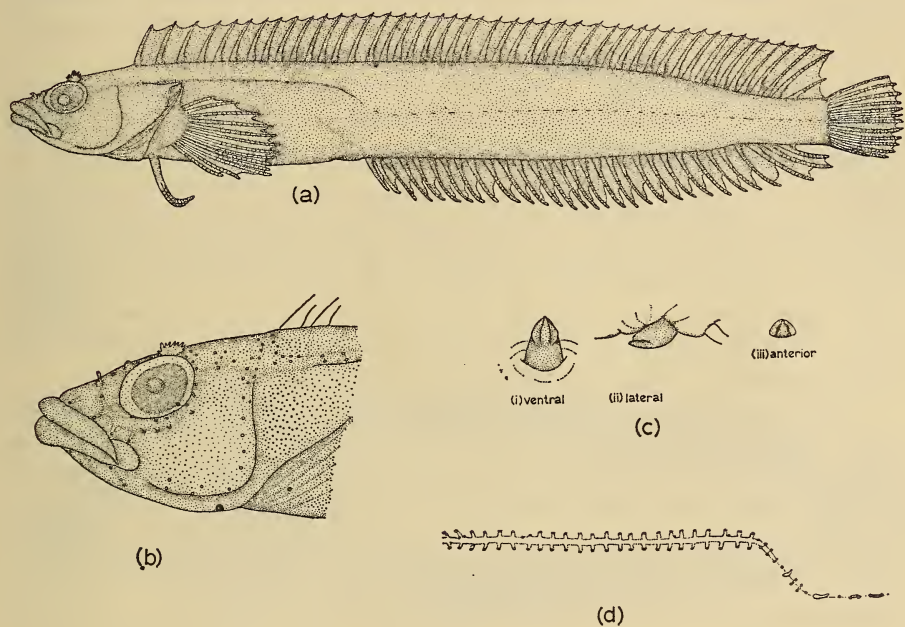


FIG. 6. *Clinus (Blennophis) striatus*: (a) Lateral view, female, 142 mm, S.A.M. 25239, lectotype; (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

Subgenus *Cirrhobarbis* Cuvier, 1817

Cirrhobarbis Cuvier, 1817: 174 (type-species *Cirrhobarbis capensis* Valenciennes in Cuvier & Valenciennes).

Diagnosis: Elongate clinids. Snout pointed, with three stout, simple cirri at tip; chin with eight stout, simple cirri. Small scales on cheek, dorsal, caudal and anal fin bases, as well as over general body surface. Dorsal fin low, even, with clusters of fine cirri at tips of spines.

One species, *Clinus (Cirrhobarbis) capensis* (Valenciennes in Cuvier & Valenciennes).

Clinus (Cirrhibarbis) capensis (Valenciennes in Cuvier & Valenciennes, 1836)

(Fig. 7)

Cirrhibarbis capensis Valenciennes in Cuvier & Valenciennes, 1836: 405. Swainson, 1839: 277 fig. 86. Smith, 1945: 539, 1949: 352, pl. 77 fig. 977, and fig. 977.

Clinus capensis: Günther, 1861: 269. Gilchrist & Thompson, 1908: 131. Barnard, 1927: 853.

Description. D. XXXVII–XLIV (XXXVIII–XLI) 5–9 (6); A. II 26–34 (26–29); P. 12–14 (13); V. I 2–3; C. 13. Gill-rakers in outer series on first arch 2–3 + 5–7. Vertebrae 18–21 + 32–37. Dorsal fin low, even. Clusters of 3–5 fine cirri at tips of dorsal spines. Pectoral fin rounded. Inner pelvic ray reduced, with free tip very short, or absent. Caudal peduncle short, length 20–30% head length, depth 18–26% head length. Caudal fin subtruncate.

Body elongate, slightly compressed, covered with small embedded scales extending on to dorsal, caudal and anal fin bases, and cheeks. Depth 5–6 in standard length, occasionally greater. Head narrow, pointed, 3.5–4.5 in standard length. Snout with three stout, simple cirri at tip; chin with eight stout, simple cirri clustered about jaw symphysis. Supraorbital tentacle prominent, with broad flat stalk and fringe of fine cirri at tip. Eye 3.5–5.5 in head. Cirrus on anterior nostril large, spatulate, with about four shallow, flat lobes at tip. Upper jaw 37.5–47.5% head length. Lips thick. Vomer toothed. Most of sensory pores of head double; multiple pores occur mainly in postorbital and occipital series (fig. 7(b)).

Lateral line of vertical pairs of pores in front to post-pectoral curve, then of short separate horizontal tubes with pore at each end (fig. 7(d)). Intromittent organ of male with long basal portion; pair of large confluent dorsal lips and pair of rounded ventral lips ensheathing tip (fig. 7(c)).

Colouring. Variable, pinkish, grey, or greenish mottled. Light-edged dark ocellus on shoulder. Fins and facial cirri usually red. A juvenile specimen from Lambert's Bay and two specimens from the west coast of the Cape Peninsula, one juvenile and one adult, were milky white with longitudinal black stripes and red fins and facial cirri. Buff to pinkish preserved in alcohol, shoulder spot may remain distinct.

Location of type material. Muséum National d'Histoire Naturelle, Paris.

Material examined. 97 specimens, 28–246 mm in standard length. 2 from Cape of Good Hope, Paris Museum Cat. Nos. 710, 6334 (syntypes); 1 from Lambert's Bay, S.A.M. 24237; 1 from Kommetjie, Cape Peninsula, S.A.M. 23926; 1 from Froggy Pond, False Bay, S.A.M. 23930; 2 from Kalk Bay, False Bay, S.A.M. 18224, S.A.M. 18276; 11 from Dalebrook, False Bay, 19/2/1965 and 18/4/1965, S.A.M. not catalogued; 14 from St. James, False Bay, S.A.M. 10530, S.A.M. 12018, S.A.M. 23583, and 1962, S.A.M. not catalogued; 29 from Strandfontein, False Bay, S.A.M. 23975, S.A.M. 24236; 1 from Gordon's Bay, False Bay, S.A.M. 23290; 4 from Onrust River Mouth, S.A.M. 24238; 10 from Still Bay,

S.A.M. 25098, S.A.M. 24665; 4 from Mossel Bay, S.A.M. 23929; 4 from Port Elizabeth, S.A.M. 23928; 2 from Igoda Mouth, East London, S.A.M. 25099; 8 from East London, S.A.M. 23927; 3 from Gonubie River Mouth, East London, S.A.M. 25100.

Remarks. This species can be distinguished at once from all other African clinid species by the facial cirri, but it is considered similar enough to the other tentacled species to be included in the genus *Clinus*. It is most similar to the eel-like forms of the subgenus *Blennophis* in body form, type of habitat, and the very short caudal peduncle, as well as the scaly cheeks; the clusters of cirri at the tips of the dorsal spines, the intromittent organ with its two pairs of lips and the high dorsal soft ray count are more similar to the conditions found in some of the species of the subgenus *Clinus*.

Distribution (fig. 4). The known range is Lambert's Bay ($32^{\circ}04'S.$, $18^{\circ}20'E.$) to East London ($33^{\circ}00'S.$, $17^{\circ}56'E.$). The source of Smith's (1949) Port Nolloth record for this species is not known, and in spite of extensive collecting there its occurrence has not been confirmed. It is rare west of Cape Point, but is fairly common from False Bay eastwards. It lives in shallow pools when small, but large adults appear to be more or less confined to the sublittoral fringe.

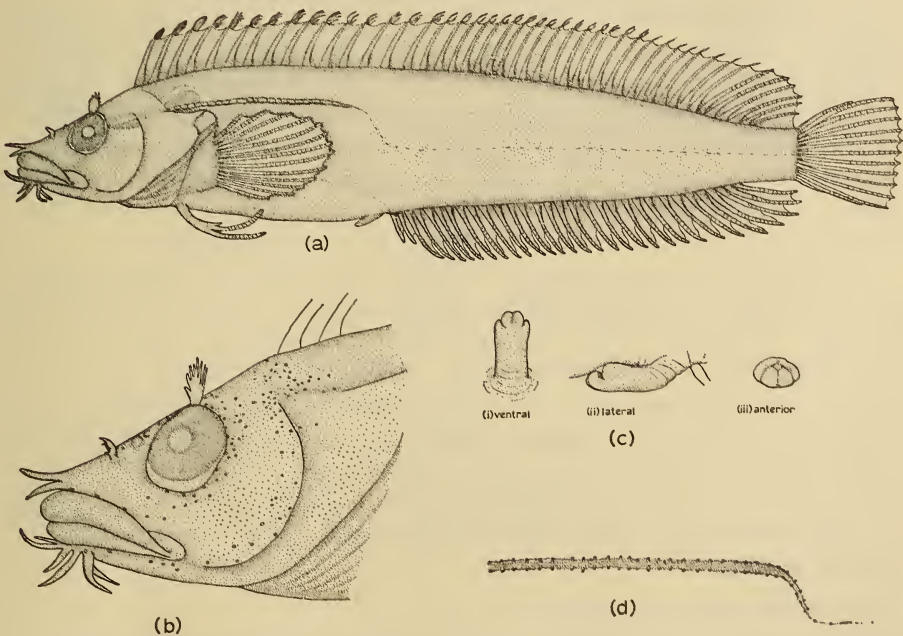


FIG. 7. *Clinus (Cirriharbis) capensis*: (a) Lateral view, male, 76 mm, S.A.M. 24236; (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

Subgenus *Muraenoclinus* Smith, 1945

Muraenoclinus Smith, 1945: 538 (type-species *Clinus dorsalis* Castelnau in Bleeker).

Diagnosis. Elongate clinids with one dorsal soft ray. No scales on cheeks. Dorsal fin low, even. No clusters of cirri at tips of dorsal spines. No barbels on chin or snout. Most sensory pores single. Posterior part of lateral line of short separate horizontal tubes with pore at either end.

One species, small and intertidal; fairly common on the west coast, less so eastwards to the south coast of Natal.

Clinus (Muraenoclinus) dorsalis Castelnau in Bleeker, 1860
(Fig. 8)

Clinus dorsalis Castelnau in Bleeker, 1860: 54. Castelnau, 1861: 54. Gilchrist & Thompson, 1908: 132. Barnard, 1927: 86.

Muraenoclinus dorsalis: Smith, 1945: 538, 1949: 352, pl. 78 fig. 979.

Description. D. XLI–XLVIII (XLV–XLVI) 1; A. II 25–31 (26–29); P. 11–13 (12); V I 2–3; C. 13. Gill-rakers in outer series on first arch 2 + 0–3. Vertebrae 19 + 32–35. Dorsal fin low, even. No clusters of cirri at dorsal spine tips. Pectoral fin rounded. Inner pelvic ray reduced, often absent, if present minute. Caudal peduncle very short, length 16.5–20% head length, depth 26–33.5% head length. Caudal fin short, subtruncate.

Body elongate, eel-like, slightly compressed, covered with small embedded scales not extending on to fin bases or head. Depth 5.5–7. Head narrowly wedge-shaped, snout acutely pointed, head 3.5–5 in standard length. Eye 3–4.5 in head. Supraorbital tentacle prominent, with flat stalk and terminal fringe of fine cirri. Cirrus on anterior nostril narrow at base, tip broadly spatulate, with deeply serrated edge. Upper jaw 34.5–46% head length. Lips thick. Vomer toothed. Sensory pores of head single in most series, last pore of preopercular series and most pores of suborbital series double (fig. 8(b)).

Lateral line of single pores opening above and below line in front to postpectoral curve, then of short separate horizontal tubes with pore at either end (fig. 8(d)). Intromittent organ of male with long basal portion; pair of dorso-lateral lips and pair of rounded ventral lips ensheathing tip (fig. 8(c)).

Colouring. Plain dark green or red, or light greenish or brownish mottled with darker greens, browns, and mauves. Mottled specimens have ocellate spot on shoulder. Broad white stripe from base of first dorsal spine to tip of snout. Fins same as general body colour. Juveniles usually uniform light brown or black with white stripe from dorsal origin to tip of snout. Plain yellowish buff preserved in alcohol.

Location of type material. Unknown.

Material examined. 138 specimens, 23–71.5 mm in standard length. 26 from Lüderitzbucht, S.A.M. 10535, S.A.M. 24207; 17 from Port Nolloth, S.A.M. 24222; 22 from Lambert's Bay, S.A.M. 23931; 3 from Saldanha Bay, S.A.M.

17913; 6 from Sea Point, S.A.M. 23932 and 17/2/1965, S.A.M. not catalogued; 14 from Kalk Bay, S.A.M. 10536; 2 from Dalebrook, False Bay, S.A.M. 24239 and 18/4/1965, S.A.M. not catalogued; 20 from St. James, False Bay, 1962, S.A.M. 23935; 1 from False Bay, S.A.M. 23934; 5 from Onrust River Mouth, S.A.M. 24258; 1 from Hermanus, S.A.M. 23933; 9 from Die Dam, Bredasdorp district, S.A.M. 24505; 3 from Still Bay, S.A.M. 18077 and April, 1965, S.A.M. not catalogued; 4 from Great Fish Point and East London, S.A.M. 18091; 4 from East London, S.A.M. 23936.

Remarks. *Clinus dorsalis* most closely resembles *Clinus navalis*. Jackson (1950) placed it in his subgenus *Blennophis* with *Clinus anguillaris* and *Clinus striatus*, but in view of the naked cheeks and the single soft dorsal ray it seems more appropriate to place it in a separate subgenus.

Note on the author of Clinus dorsalis

Gilchrist & Thompson (1908), Thompson (1918), Barnard (1927) and Smith (1945, 1949) gave Bleeker (1860) as the author of this species, but this appears to be incorrect. The first record of the species was published by Bleeker (1860), but it was listed as *Clinus dorsalis* Castelnau although Castelnau's description of the species was published a year later, in 1861. In a brief note

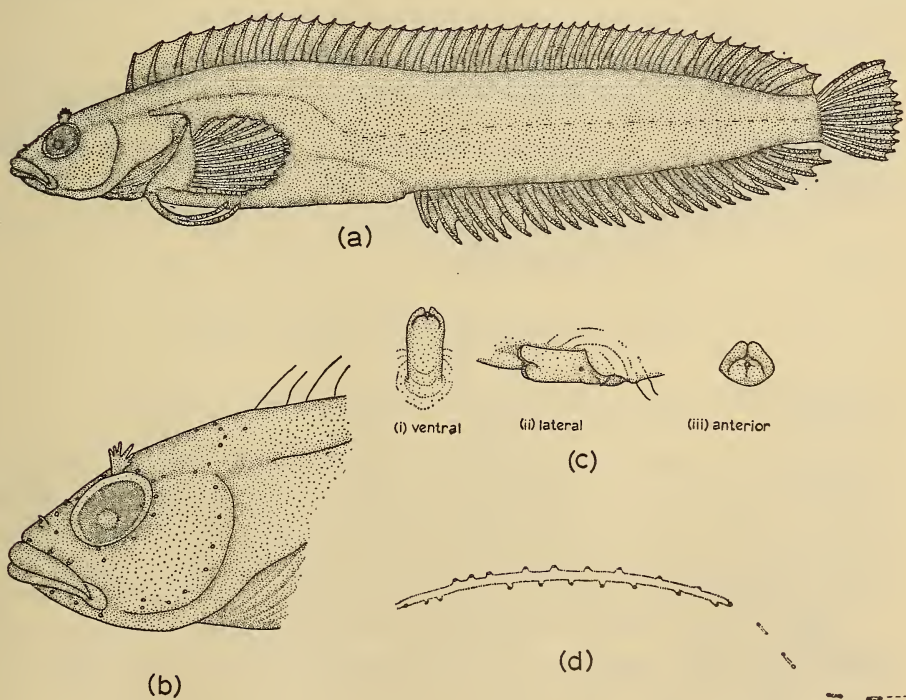


FIG. 8. *Clinus (Muraenoclinus) dorsalis*: (a) Lateral view, female, 64 mm, S.A.M. 24207; (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

published in 1860 Castelnau discussed the fish fauna of South Africa and stated that he would be producing a memoir on the ichthyological fauna of southern Africa, in which 69 new species would be described. It seems probable that Bleeker saw and quoted from Castelnau's list of species prior to its publication in 1861. He should not be regarded as the author of the species, since he acknowledged Castelnau as the author, and the full description of the species was written and published by Castelnau.

Distribution (fig. 4). The known range of this species is Lüderitzbucht ($26^{\circ}38'S$, $15^{\circ}10'E$) (South West Africa) to the Natal South Coast (Smith, 1947a). Smith (1937) gave the north-western limit of this species as Walvis Bay, stating that he took this record from Barnard (1927). However, Barnard (1927) gave the north-western limit as Angra Pequena (Lüderitzbucht), so that the 1937 Walvis Bay record was due to an error in transcription. The occurrence of the species north of Lüderitzbucht has not been confirmed.

Usually found among stones in shallow pools high on the shore, but occurs at all levels of the intertidal zone. This species appears to be more common west of Cape Agulhas.

Subgenus *Climacoporus* Barnard, 1935

Climacoporus Barnard, 1935: 646 (type-species *Climacoporus navalis* Barnard).

Nemacoclinus Smith, 1937: 195 (referring to *Climacoporus navalis* Barnard).

Diagnosis. Fairly elongate clinids with one dorsal soft ray. No scales on cheeks. Dorsal fin low, even. No clusters of cirri at tips of dorsal spines. No barbels on chin or snout. Most sensory pores double; vertical pairs of pores in posterior part of lateral line.

One species, small and intertidal, occurring only east of Cape Agulhas and rare.

Clinus (*Climacoporus*) *navalis* (Barnard, 1935)

(Fig. 9)

Climacoporus navalis Barnard, 1935: 646. Smith, 1945: 538, 1949: 352, pl. 78 fig. 978.

Nemacoclinus navalis: Smith, 1937: 195.

Description. D. XXXV-XXXVIII 1; A. II 23; P. 12; V. I 2-3; C. 13. Gill-rakers in outer series on first arch 1-2 + 5. Vertebrae 15 + 27-29. Dorsal fin low, even. No clusters of cirri at tips of dorsal spines. Pectoral fin rounded. Inner (third) ray of pelvic fin reduced or absent. Caudal peduncle short, length 25-33.5% head length, depth 25-33.5% head length. Caudal fin subtruncate.

Body elongate, slightly compressed, covered with small, embedded, non-imblicating scales extending on to dorsal, caudal, and anal fin bases but not head. Depth 5-6.25. Head 4-5.25 in standard length, snout rounded. Eye 3-4 in head. Supraorbital tentacle prominent, with flat stalk and fringe of fine cirri terminally. Cirrus on anterior nostril small, flap-like, slightly emarginate

below apex. Upper jaw 38–44.5% head length. Lips thick. Vomer toothed. Sensory pores of head single in nasal, interorbital, and mandibular series, mainly double in all other series (fig. 9(b)).

Lateral line of vertical pairs of pores throughout; narrows and may become obscure towards tail (fig. 9(d)). Intromittent organ of male long, slender with apparently no definition into tip, basal part and lips (fig. 9(c)).

Colouring. Yellow-brown to greenish, mottled and barred irregularly with darker green or brown; head green or reddish brown; belly cream. Light-edged dark ocellus on shoulder. Plain buff preserved in alcohol.

Location of type material. South African Museum, Cape Town.

Material examined. 10 specimens, 18–57 mm in standard length. 1 from ship's bottom, Simonstown, False Bay, S.A.M. 18287 (holotype); 2 from Still Bay, S.A.M. 25101; 1 from Port Elizabeth, S.A.M. 23889; 1 from Boknes Point, R.U.C.; 2 from Great Fish Point, R.U.C.; 1 from Igoda Mouth, East London, S.A.M. 25102; 2 from Xora Mouth, R.U.C.

Remarks. The arrangement of the double pores of the lateral line of this species is exactly the same as the arrangement seen in the anterior part of the lateral line of other species that have double pores, such as *Clinus capensis*. In view of the many features which *Clinus navalis* has in common with other species of the

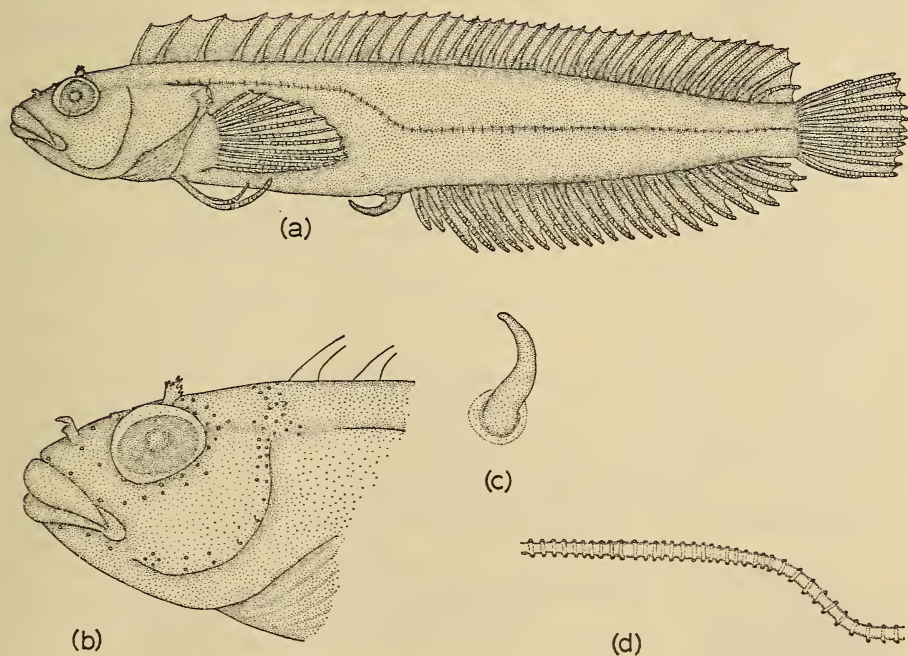


FIG. 9. *Clinus (Climacoporus) navalis*: (a) Lateral view, male, 55.5 mm, S.A.M. 18287, holotype; (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

genus *Clinus*, particularly *Clinus dorsalis*, I believe that to set this species apart on account of the lateral line would obscure its relationships with the rest of the group. The intromittent organ, however, is very peculiar. In the few male specimens available it was very strongly erect; the finer structure may have been obscured to some extent. There is some resemblance to the erect organ of *C. brevicristatus*, which shows but little definition at the tip.

Distribution (fig. 4). The known range is Still Bay ($34^{\circ}23'S.$, $21^{\circ}24'E.$) to Port St. Johns ($31^{\circ}37'S.$, $29^{\circ}32'E.$). The first specimen described was found among barnacles on a ship's bottom at Simonstown, but the species does not normally occur in the region of the Cape Peninsula.

Subgenus *Clinus* Cuvier, 1817

Clinus Cuvier, 1817: 173 (type-species *Blennius acuminatus* Bloch & Schneider).

Clinitrachus Swainson, 1839: 75 (in part); (type-species *Blennius variabilis* Rafinesque).

Ophthalmolophus Gill, 1860: 104 (type-species *Clinus latipennis* Valenciennes).

Blenniomimus Smith, 1945: 538 (type-species *Clinus taurus* Gilchrist & Thompson).

Caboclinus Smith, 1966: 73 (type-species *Clinus robustus* Gilchrist & Thompson).

Diagnosis. Body not elongate. Head naked. No barbels on chin or snout. More than one dorsal soft ray.

Thirteen species, occurring mainly among rocks in intertidal pools. These species are difficult to identify from a key, as they are extremely variable. Two keys are given, but species should always be compared with the description as well.

Key to the species of the subgenus *Clinus*

1. Anterior three dorsal spines, or at least the second and third dorsal spines, elevated, higher than fourth dorsal spine 2
Anterior three dorsal spines equal to or shorter than fourth dorsal spine 6
2. Dorsal soft rays three or less. Second spine highest; no notch in membrane between third and fourth dorsal spines *Clinus (Clinus) venustris*
Dorsal soft rays four or more; a notch of varying depth in membrane between third and fourth dorsal spines 3
3. Pectoral rays 15 or more *Clinus (Clinus) superciliosus*
Pectoral rays 14 or fewer 4
4. Crest high, triangular; dorsal fin originates over hind margin of eye *Clinus (Clinus) woodi*
Crest low, rectangular to rounded; dorsal fin originates over hind margin of preopercle 5
5. Lips with vertical corrugations; dorsal soft rays nine or more *Clinus (Clinus) robustus*
Lips smooth; dorsal soft rays seven or fewer *Clinus (Clinus) brevicristatus*
6. A notch of varying depth in membrane between third and fourth dorsal spines 7
No notch in membrane between third and fourth dorsal spines 8
7. Interorbital concave, strong bony ridges over eyes; occiput with deep transverse groove *Clinus (Clinus) taurus*
Interorbital flat, no ridges over eyes; no deep occipital groove *Clinus (Clinus) agilis*
8. Interorbital strongly concave, bony ridges over eye; occipital groove deep; dorsal soft rays six or fewer *Clinus (Clinus) cottoides*
Interorbital flat, or only slightly concave; occipital grooves if present shallow 9
9. Dorsal soft rays 8-9 *Clinus (Clinus) latipennis*
Dorsal soft rays seven or fewer 10
10. Dorsal soft rays 2-3 *Clinus (Clinus) venustris*
Dorsal soft rays 4-7 11

11. Dorsal spines 34-37.. .. . 12
 Dorsal spines 33 or fewer 13
12. Mucous pores on head open on papillae; snout bluntly rounded *Clinus (Clinus) helenae*
 Mucous pores on head open flush with surface; snout more or less wedge-shaped
Clinus (Clinus) berrisfordi
13. First dorsal spine shorter than fourth spine; pectoral rays usually 12; intromittent organ of male broad and flattened towards tip *Clinus (Clinus) acuminatus*
 First dorsal spine equal to or very slightly longer than fourth; pectoral rays 13; intromittent organ of male slender, cylindrical *Clinus (Clinus) heterodon*

Alternative key to the species of the subgenus Clinus

- No. of
 soft dorsal
 rays
- 2-3 1. Dorsal spines 39-41.. .. . *Clinus (Clinus) venustris*
 Dorsal spines 34-37.. .. . *Clinus (Clinus) agilis*
- 4 1. Interorbital concave *Clinus (C.) cottoides*
 Interorbital flat 2
2. First three dorsal spines higher than fourth, forming a crest 3
 First three dorsal spines lower than fourth, not forming a crest 4
3. Pectoral rays 15 or more *Clinus (C.) superciliosus*
 Pectoral rays 14 or fewer *Clinus (C.) brevicristatus*
4. A notch in membrane between third and fourth dorsal spines; dorsal spines 34-37
Clinus (C.) agilis
 No notch in membrane between third and fourth dorsal spines; dorsal spines 33 or fewer *Clinus (C.) acuminatus*
- 5 1. First three dorsal spines higher than fourth, forming a crest 2
 First three dorsal spines lower than or equal to fourth, not forming a crest 4
2. Pectoral rays 15 or more *Clinus (C.) superciliosus*
 Pectoral rays 14 or fewer 3
3. Crest high, triangular, originates over hind margin of eye *Clinus (C.) woodi*
 Crest low, originates over hind margin of preopercle *Clinus (C.) brevicristatus*
4. A notch in membrane between third and fourth dorsal spines *Clinus (C.) taurus*
 No notch in membrane between third and fourth dorsal spines 5
5. A large round black spot on the opercle *Clinus (C.) cottoides*
 No large black spot on opercle 6
6. First dorsal spine lower than fourth 7
 First dorsal spine equal to or a little longer than fourth *Clinus (C.) berrisfordi*
7. Dorsal spines 33 or fewer; pectoral rays 12 *Clinus (C.) acuminatus*
 Dorsal spines 34 or more; pectoral rays 13 *Clinus (C.) helenae*
- 6 1. First three dorsal spines high, forming a crest 2
 First three dorsal spines not forming a crest 3
2. Pectoral rays 15 or more *Clinus (C.) superciliosus*
 Pectoral rays 14 or fewer *Clinus (C.) brevicristatus*
3. A notch in membrane between third and fourth dorsal spines *Clinus (C.) taurus*
 No notch in membrane between third and fourth dorsal spines 4
4. A large round black spot on the opercle *Clinus (C.) cottoides*
 No large black spot on opercle 5
5. First dorsal spine lower than fourth 6
 First dorsal spine equal to or a little longer than fourth 7
6. Pectoral rays 12; dorsal spines 33 or fewer *Clinus (C.) acuminatus*
 Pectoral rays 13; dorsal spines 34 or more *Clinus (C.) helenae*
7. Pectoral rays 12 *Clinus (C.) berrisfordi*
 Pectoral rays 13 *Clinus (C.) heterodon*
- 7 1. First three dorsal spines high, forming a crest 2
 First three dorsal spines not forming a crest 3

No. of soft dorsal rays							
7	2.	Pectoral rays 15 or more	..	..	..	..	<i>Clinus (C.) superciliosus</i>
		Pectoral rays 14 or fewer	..	..	..	..	<i>Clinus (C.) brevicristatus</i>
3.		First dorsal spine lower than fourth; pectoral rays 12; intromittent organ of male broad and flattened toward tip	..	..	..	..	<i>Clinus (C.) acuminatus</i>
		First dorsal spine equal to or a little higher than fourth; pectoral rays 13; intromittent organ of male slender, cylindrical	..	..	..	..	<i>Clinus (C.) heterodon</i>
8	1.	First three dorsal spines high, forming a crest	..	..	..	..	<i>Clinus (C.) superciliosus</i>
		First three dorsal spines not forming a crest	..	..	..	..	<i>Clinus (C.) latipennis</i>
9	1.	Lips with vertical corrugations	..	..	..	..	<i>Clinus (C.) robustus</i>
		Lips smooth	..	..	..	..	.. .. 2
	2.	First three dorsal spines high, forming a crest	..	..	..	..	<i>Clinus (C.) superciliosus</i>
		First three dorsal spines not forming a crest	..	..	..	..	<i>Clinus (C.) latipennis</i>
10	1.	Lips with vertical corrugations	..	..	..	..	<i>Clinus (C.) robustus</i>
		Lips smooth	..	..	..	..	<i>Clinus (C.) superciliosus</i>
11-14		.. .. ..	..	..	..	..	<i>Clinus (C.) robustus</i>

Clinus (Clinus) acuminatus (Bloch & Schneider, 1801)

(Fig. 10)

Blennius acuminatus Bloch & Schneider, 1801: 169.

Clinus acuminatus: Cuvier, 1817: 175. Valenciennes in Cuvier & Valenciennes, 1836: 370. Swainson, 1839: 75. Gilchrist & Thompson, 1908: 124. Barnard, 1927: 859. Hubbs, 1952: 106. Smith, 1966: 73. Penrith 1967: 43, figs 1, 4(a).

Ophthalmolophus acuminatus: Smith, 1945: 542, 1949: 355, pl. 79 fig. 991.

Description. D. XXXI-XXXIII (XXXII-XXXIII) 5-7; A. II 20-24 (21-22); P. 12-13 (12); V. I 2-3; C. 13. Gill-rakers in outer series on first arch 1-2 + 4-6. Vertebrae 16 + 27-29. Dorsal fin low, even. Clusters of 2-3 cirri at tips of dorsal spines for about half length of dorsal fin. Pectoral fin rounded. Inner pelvic ray reduced or absent. Caudal peduncle short, length 20.5-33.5% head length, depth 20-35% head length. Caudal fin subtruncate.

Body slightly compressed, covered with small scales extending on to dorsal fin base; caudal and anal fin bases and head naked. Depth 4.5-6 in standard length. Head large, 3.2-4 in standard length, snout wedge-shaped, angle of profile acute. Eye 2.75-5 in head. Supraorbital tentacle prominent, with short, flattened stalk terminating in several short, simple branches. Cirrus on anterior nostril short, flattened, trilobed. Upper jaw 34.5-50% head length, increasing with size of fish. Lips moderate. Vomer toothed. Sensory pores of all head series single excepting last pore of preopercular series and one pore of suborbital series, which are double (fig. 10(b)).

Lateral line usually of 2-4 vertical pairs of pores in front above opercle, then of mainly single pores opening above and below the line to post-pectoral curve; after that of short separate horizontal tubes with pore at either end (fig. 10(d)). Intromittent organ of male large, flattened, and spade-shaped, with moderately long, thick basal portion, pair of small dorsal lips, and large,

broad pair of ventro-lateral lips ensheathing tip (fig. 10(c)).

Colouring. Light green with broad, well-defined dark brown cross-bars, or with black speckling in sparse large spots with mosaic-like pattern. Tips of all fins and of supraorbital tentacles reddish orange. Belly silvery white. Dark ocellate spot on shoulder, and two dark radiating bands from eye across cheek. Small juveniles white with well-defined black cross-bars. Pattern retained for several years after preservation.

Location of type material. Unknown.

Material examined. 182 specimens, 19–113.5 mm in standard length. 17 from Lüderitzbucht, S.A.M. 10544, S.A.M. 24206; 38 from McDougall's Bay, Port

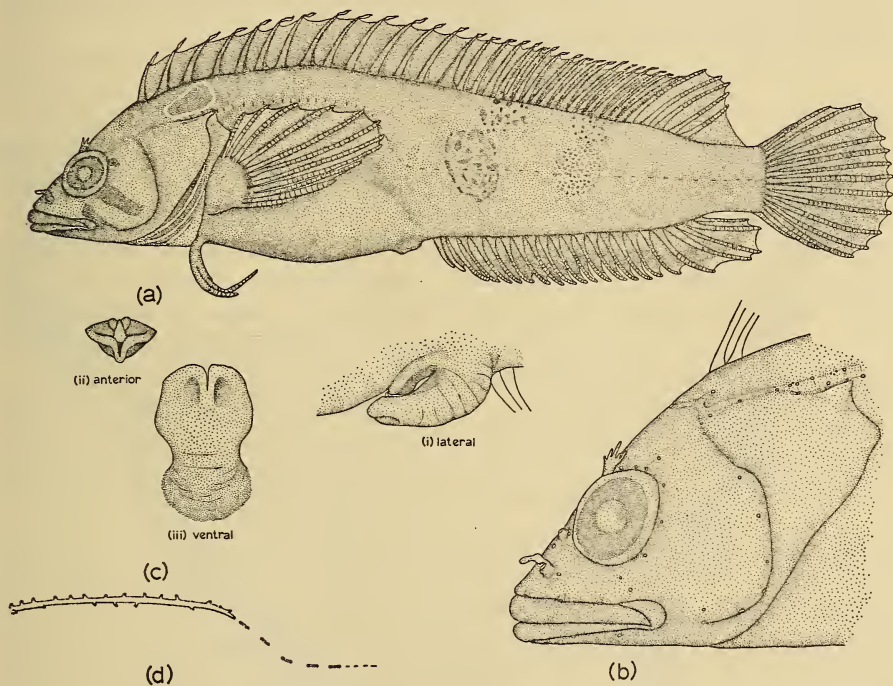


FIG. 10. *Clinus (Clinus) acuminatus*: (a) Lateral view, female, 73 mm, S.A.M. 24255; (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

Nolloth, S.A.M. 24220; 12 from Port Nolloth, 12/7/1960, R.U.C.; 15 from Lambert's Bay, S.A.M. 21477, S.A.M. 23922 and 17/1/1964, S.A.M. not catalogued; 18 from Lambert's Bay, R.U.C.; 2 from Lambert's Bay, University of Cape Town; 2 from Schaapen Island, Langebaan, S.A.M. 23925; 8 from Sea Point, S.A.M. 22840, S.A.M. 23211; 3 from Kommetjie, S.A.M. 10541; 3 from Froggy Pond, False Bay, S.A.M. 23924; 28 from St. James, False Bay, S.A.M. 12023 and 1962, S.A.M. not catalogued; 2 from St. James, False Bay, R.U.C.; 21 from False Bay, S.A.M. 10542; 2 from Cape Peninsula, University of Cape

Town; 4 from Onrust River Mouth, 6/11/1964, S.A.M. not catalogued; 2 from Die Dam, Bredasdorp District, S.A.M. 24508; 5, no locality, R.U.C.

Remarks. *Clinus acuminatus* is similar on the one hand to *Clinus agilis*, having a flat interorbital, and on the other hand to species such as *Clinus cottoides*, *Clinus heterodon*, *Clinus latipennis*, and *Clinus helenae*, which lack a notch in the membrane between the third and fourth dorsal spines. It is also very similar to *Clinus berrisfordi*. Small specimens are rather similar in appearance to *Clinus dorsalis*, and occupy the same type of habitat. Smith's (1931) suggestion that *Clinus agilis* may be found to be a subspecies of *Clinus acuminatus* is not supported by a comparison of the two species, which are not sufficiently alike in appearance to be confused even in the field. Furthermore, they occur over the same geographical range and often in the same pools.

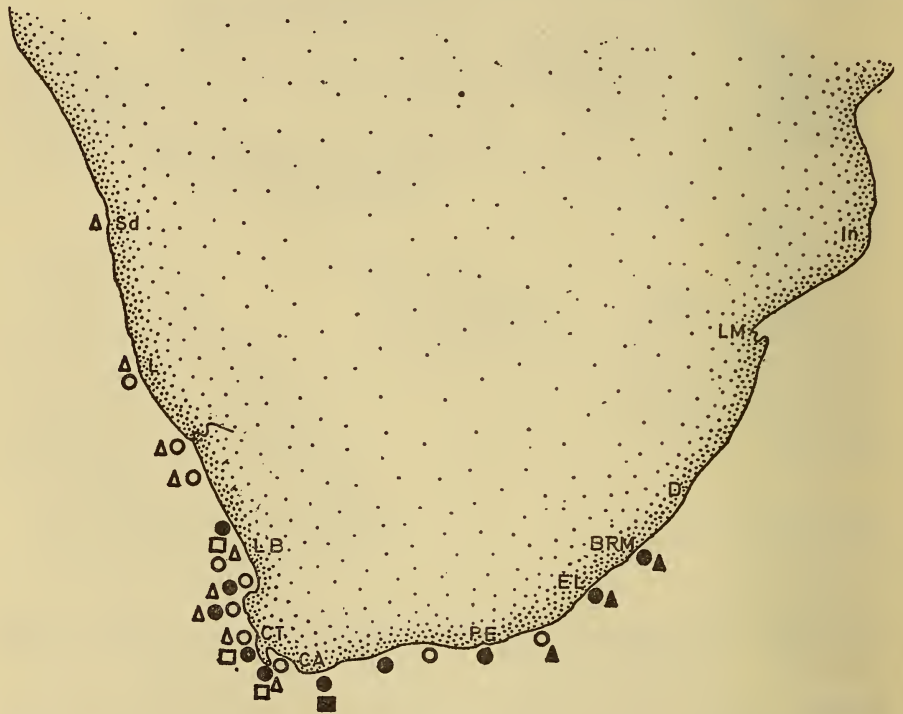


FIG. 11. Distribution of *C. agilis* (open circles), *C. berrisfordi* (closed squares), *C. brevicristatus* (open squares), *C. cottoides* (closed circles), *C. helenae* (closed triangles), *C. heterodon* (open triangles).

Distribution (fig. 4). The known range is Lüderitzbucht ($26^{\circ}28'S.$, $15^{\circ}10'E$) (South West Africa) to Cape Agulhas ($34^{\circ}50'S.$, $20^{\circ}00'E$). It is more common west of Cape Point. This species occurs in shallow, barren pools under stones and ledges at the top of the intertidal region of the shore.

Clinus (Clinus) agilis Smith, 1931

(Fig. 12)

Clinus agilis Smith, 1931: 154, pl. 16, 1966: 73.*Ophthalmolophus agilis*: Smith, 1945: 54, 1949: 355, pl. 77 fig. 988.*Ophthalmolophus anne* Smith, 1947b: 733, fig. 2, 1949: 355, pl. 77 fig. 989.*Clinus anne*: Smith, 1966: 73.

Description. D. XXXII-XXXVIII (XXXV-XXXVII) 2-4 (3); A. II 20-25 (22-23); P. 13-15; V. I 2-3; C. 13. Gillrakers in outer series on first arch 1-2 + 3-5. Vertebrae 16 (rarely 17) + 27-30. Dorsal fin low, first three spines not elevated to form crest, but notch in membrane between third and fourth dorsal spines, varying in depth, rarely absent (see table 3). Clusters of 3-4 cirri at tips of dorsal spines for about half length of fin. Pectoral fin rounded. Inner pelvic ray, if present, minute; usually absent. Caudal peduncle short, length 23-31% head length, depth 25.5-29% head length. Caudal fin subtruncate.

Body slightly compressed, covered with small scales not extending on to fin bases or head. Depth 4.5-5.25 in standard length. Head 3.5-4.5 in standard length, snout rounded. Eye 3-4.25 in head. Supraorbital tentacle prominent, with flat stalk dividing into several short simple branches at tip. Cirrus on anterior nostril long, narrow, pointed. Upper jaw 40-50% head length. Lips fairly thick. Vomer toothed. Sensory pores of head single in nasal and interorbital series, mainly single in mandibular and preopercular series; pores in remaining series double or multiple (fig. 12(b)).

Lateral line of vertical pairs of pores and single pores opening above and below line in front to post-pectoral curve, then of short separate horizontal tubes with pore at either end (fig. 12(d)). Intromittent organ of male with long basal portion; tip completely ensheathed by 2 pairs of confluent lips. Pair of rounded fleshy lobes within fold, between which is minute tip (fig. 12(c)).

Colouring. Ground colour usually dark greyish or greenish, with about 7 distinct dark red and green cross-bars. Occasional specimens have pinkish or milky ground colour with darker pink cross-bars, or vermilion ground colour with dark brown cross-bars. Fins dark, irregularly barred; characteristic translucent area in membrane joining dorsal soft rays. Belly silvery white to greyish. Sprinkling of white spots over body sometimes. Head with irregular lacy patterns in body colours, or plain dark grey. Light-edged dark ocellate spot on shoulder usually. Juveniles white with well-defined red cross-bars. Pattern remains for several years after preservation.

Location of type material. Department of Ichthyology, Rhodes University, Grahamstown. One paratype in South African Museum.

Material examined. 672 specimens, 17-113 mm in standard length. 191 from Lüderitzbucht, S.A.M. 24205; 1 from Sinclair's Island, R.U.C.; 3 from Orange River Mouth, 5 fms, S.A.M. 23964; 246 from Port Nolloth, S.A.M. 24214; 1 from Hondeklip Bay, March 1965, S.A.M. not catalogued; 6 from Gert du

Toit Bay and 4 from Doring Bay, southern Namaqualand, S.A.M. 24232; 5 from Lambert's Bay, R.U.C. (syntypes of *anne*); 108 from Lambert's Bay, S.A.M. 23919; 1 from Lambert's Bay, R.U.C.; 13 from Steenberg's Cove, St. Helena Bay, 1962, S.A.M. not catalogued; 3 from Saldanha Bay, S.A.M. 22072, S.A.M. 23921; 5 from Langebaan, S.A.M. 21475, S.A.M. 21479; 38 from Sea Point, S.A.M. 23212, S.A.M. 23920, and 17/2/1965, S.A.M. not catalogued; 6 from Froggy Pond, False Bay, S.A.M. 23906; 2 from Dalebrook, False Bay, 19/2/1965, S.A.M. not catalogued; 1 from Knysna, S.A.M. 18278 (paratype); 38 from Knysna, S.A.M. 24233.

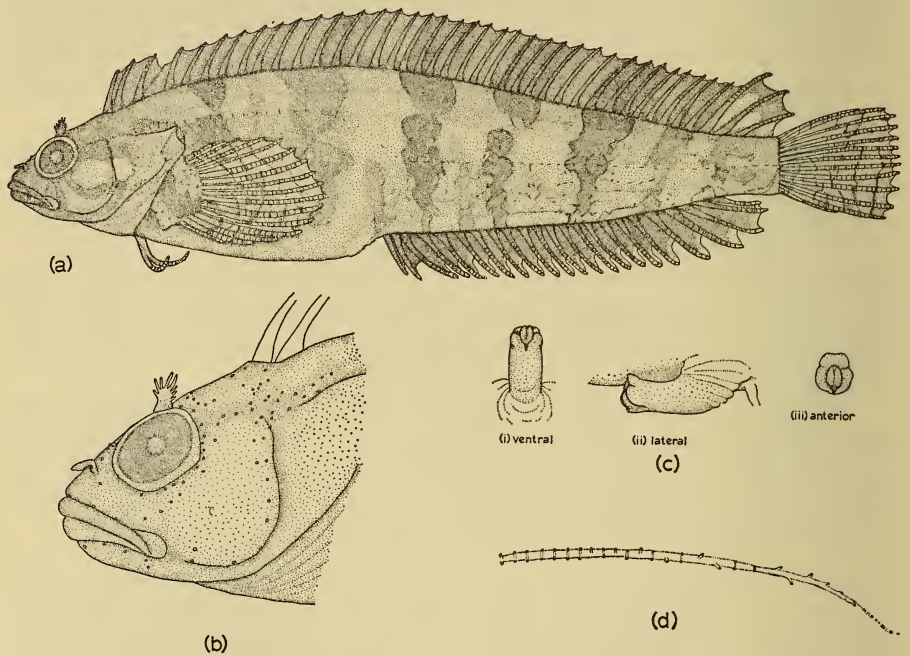


FIG. 12. *Clinus (Clinus) agilis*: (a) Lateral view, female, 113 mm, Hondeklip Bay, S.A.M.; (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

Remarks. It has been believed for some time at the South African Museum that this species and *Ophthalmolophus anne* Smith, 1947, are probably conspecific. In attempting to identify large samples from the west coast, one might arrive at either species in Smith's (1949) key, or at both species for different specimens of the same sample. Smith (1931) created *agilis* for seven specimens taken from Knysna estuary, ranging in size from 55–65 mm. In 1947 he created *anne* for five specimens, 24–50 mm, from the west coast, mainly Lambert's Bay. He differentiated *anne* from *agilis* on the following points: (1) number of dorsal spines (34–35 for *agilis*, 36–37 for *anne*); (2) eye size (3–4 in head in *agilis*,

4.2-4.5 in head in *anne*); (3) snout length (greater in *anne*, no figures given); (4) pectoral length (greater in *anne*, no figures given); (5) pelvic length (less in *anne*, no figures given). Since so few specimens were examined, and the size range of the samples did not overlap, the four points relating to body proportions may probably be ignored. In the Clinidae body proportions have been found to vary considerably with size, so that comparable size ranges are essential for the comparison of body proportions of different species; furthermore, the ranges found for body proportions tend to be very wide in the Clinidae, so that other features are usually more important for delimiting species. In any case, the orbit diameter of 19 specimens of *Clinus agilis*, all from the west coast and therefore falling in Smith's species *anne*, was measured and was found to be 2.6-4.25 in head (size range of specimens 31-93 mm in standard length), very close to the range found by Smith (1931) for his Knysna specimens. 15 specimens from Knysna, ranging from 31-59 mm in standard length, showed an orbit diameter range 2.5-3.5 (see table 4). As far as the dorsal spine count is

TABLE 4. Comparison of orbit diameter of *Clinus agilis* from south-east and south-west coasts of the Cape.

East Coast (<i>agilis</i> Smith)		West Coast (<i>anne</i> Smith)	
Std. length (mm)	Eye in head	Std. length (mm)	Eye in head
31	3.3	31	3.3
31	2.7	31	2.8
32	3.3	31	3.3
33	3.3	33	3.3
35	3.0	35	2.9
37	3.0	37	2.7
39	2.5	38	2.6
39	3.0	39	3.1
42	2.9	42	3.0
48	2.9	47	3.0
49	3.4	49.5	3.3
51	3.5	51	3.4
52	3.5	53	3.5
55	2.9	55	3.1
59	3.3	60	3.4
		67	3.5
		70	3.6
		82	4.25
		93	3.8

concerned, samples from the west coast showed a range of 33-38 dorsal spines, which covers the range of 34-35 of *agilis*. Furthermore, samples from different areas along the coast showed variation in the average number of dorsal spines for each population. This is shown in a histogram (fig. 13). The variation from one population to another is an interesting indication of the lack of genetic exchange between populations along the coast, a lack not surprising in view of the sedentary mode of life and the methods of reproduction of these small fishes. That such variation between localities occurs makes one hesitate to recognize even a racial difference between the east and west coast forms. The

identical intromittent organ of east and west coast specimens is the strongest argument in favour of joining these species, since the shape of the intromittent organ is strongly species-specific in the genus *Clinus*.

Smith (1947b) stated that if the seven Knysna specimens and the five west coast (Lambert's Bay) specimens had not been so widely separated geographically he would have placed them in the same species. A study of clinid distribution in South Africa has shown that there are few species from the west coast of South Africa that do not occur at least as far east as Port Elizabeth, so that the occurrence of a species at both Lambert's Bay and Knysna is not unexpected,

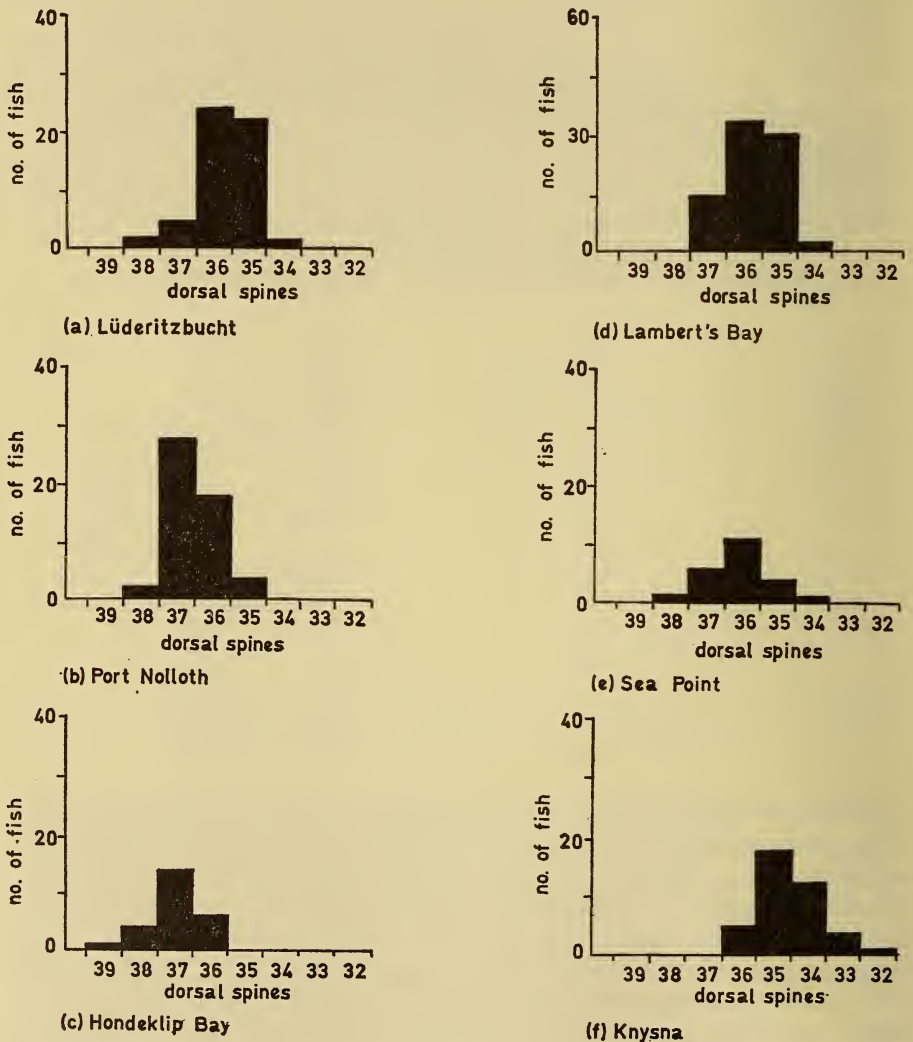


FIG. 13. Histogram showing dorsal spine count variation in different populations of *Clinus agilis*.

particularly when the species has been recorded from False Bay on several occasions as well.

It is proposed therefore that *Ophthalmolophus anne* Smith, 1947, should become a synonym of *Clinus agilis* Smith, 1931, since the two species are indistinguishable. *Clinus agilis* is common on the west coast of South Africa but becomes rare east of Cape Point.

Barnard (1948) suggested that *Clinus agilis* might be the young of *Clinus taurus* Gilchrist & Thompson, but the two species are easily distinguishable in all stages by the shape of the interorbital, which is strongly concave in *Clinus taurus* and flat in *Clinus agilis*, and by the number of dorsal soft rays (2-4 in *Clinus agilis* and 5-6 in *Clinus taurus*).

Clinus agilis is in some ways intermediate between forms with a low, even dorsal fin and no notch in the dorsal fin membrane between the third and fourth spines, such as *Clinus acuminatus*, and forms with a low dorsal crest and a notch in the dorsal fin membrane such as *Clinus brevicristatus*. There is a marked similarity in appearance between *Clinus agilis* and *Clinus brevicristatus* both in body form and colour pattern, but in the latter the first three dorsal spines are elevated, forming a crest, and there are more dorsal soft rays.

Distribution (fig. 11). The known range of this species is Lüderitzbucht (26°28'S., 15°10'E) (South West Africa) to Port Alfred (33°36'S., 26°54'E), common on the west coast in pools at all levels of the shore and also taken infratidally, but on the whole rare on the east coast, although a fairly large number of specimens was taken in Knysna lagoon. The biota of the Knysna estuary has been discussed by Day *et al.* (1952) and Day (1967). It is an exceptionally rich faunal area, and has also received a great deal more attention than any other area on the south coast of South Africa. A similar case of apparently discontinuous distribution involving a lagoon is observed in *Blennioclinus brachycephalus* on the west coast (Penrith, 1965*b*), without racial differentiation of the separated populations.

Clinus (Clinus) berrisfordi Penrith, 1967
(Fig. 14)

Clinus berrisfordi Penrith, 1967: 48, figs 3, 4(c).

Description. D. XXXIII-XXXVI (XXXIV-XXXV) 5-6; A. II 23-25 (23-24); P. 11-12 (12); V. I 3; C. 13. Gill-rakers in outer series on first arch 3-4 + 6-7. Vertebrae 16 (rarely 17) + 28-31. First three dorsal spines not elevated to form crest, but equal to or little longer than fourth dorsal spine. No notch in membrane between third and fourth dorsal spines. Dorsal spines with clusters of three fine cirri at tips for about half length of fin. Pectoral fin rounded. Inner pelvic ray minute but present in all specimens examined. Caudal peduncle short, length 20-35% head length, depth 20-35% head length. Caudal fin subtruncate.

Body slightly compressed, covered with small scales extending on to dorsal and caudal fin bases but not anal fin base or head. Depth 4.5-5 in standard

length. Head 3.4-4 in standard length, snout wedge-shaped, profile acute. Eye 3-4.2 in head. Supraorbital tentacle prominent, with flattened stalk ending in several long slender filaments. Cirrus on anterior nostril with narrow stalk and flattened, bilobed tip. Upper jaw 36.4-50% of head length. Lips moderate. Vomer toothed. Sensory pores of nasal, interorbital and mandibular series single with exception of double first pore in mandibular series; pores of remaining series double or multiple (fig. 14(b)).

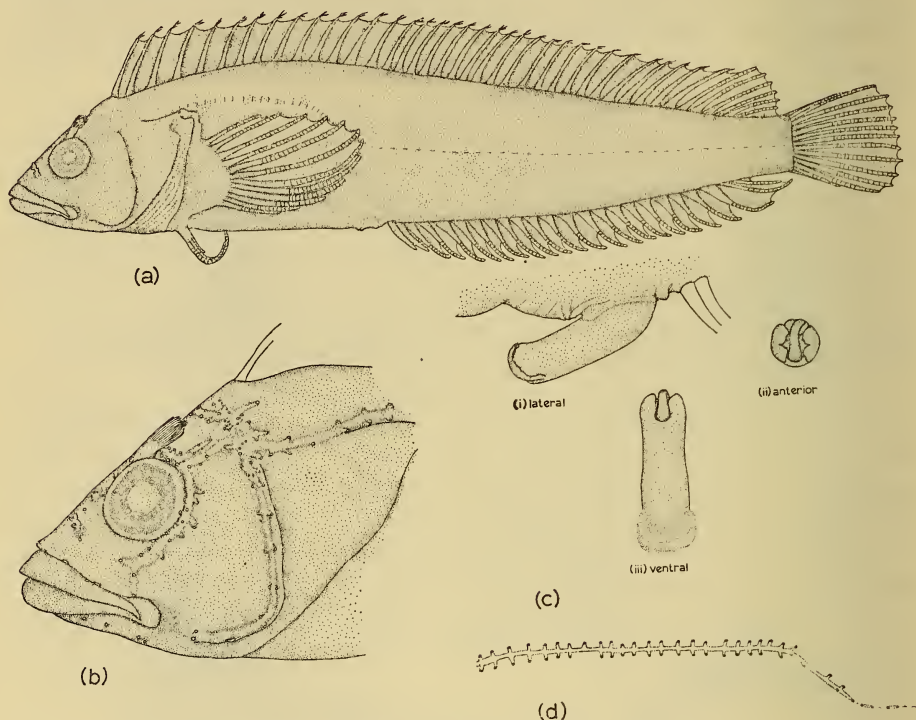


FIG. 14. *Clinus (Clinus) berrisfordi*: (a) Lateral view, female, 95 mm, S.A.M. 24221, holotype; (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

Lateral line of usually vertical pairs of pores in front to post-pectoral curve, few single pores opening above or below line, then of short separate horizontal tubes with pore at either end (fig. 14(d)). Intromittent organ of male with a long basal portion and a slender upturned tip ensheathed by a pair of bilobed ventro-lateral lips and a small pair of rounded dorsal lips (fig. 14(c)).

Colouring. Reddish orange with about seven faint broad darker cross-bars. Two dark radiating lines from eye across cheek. Dark ocellate spot on shoulder. Fins reddish orange, faintly mottled and barred. Plain yellow preserved in alcohol.

Location of type material. South African Museum, Cape Town.

Material examined. 16 specimens, 37.5-106 mm in standard length. 16 from Onrust River Mouth, S.A.M. 24601 (holotype), S.A.M. 24221 (paratypes).

Remarks. This species is similar in appearance to *Clinus acuminatus* and *Clinus heterodon* but differs from the former in the dorsal and anal fin counts, the form of the intromittent organ, the height of the first dorsal spine, the form of the supraorbital tentacle, the anterior part of the lateral line, and the habitat, occurring at a much lower level on the shore. It differs from the latter in the dorsal, anal, and pectoral fin counts, the intromittent organ (although of all the species of *Clinus*, *Clinus berrisfordi* and *Clinus heterodon* have the most similar form of intromittent organ), the anterior part of the lateral line, the clusters of cirri on the dorsal spines, and in having a narrower interorbital.

Distribution (fig. 11). So far taken only at Onrust River Mouth ($34^{\circ}25'S.$, $19^{\circ}10'E$). The 16 specimens were taken from a weedy pool at the bottom of the intertidal region.

Clinus (*Clinus*) *brevicristatus* Gilchrist & Thompson, 1908

(Fig. 15)

Clinus brevicristatus Gilchrist & Thompson, 1908: 118. Barnard, 1927: 856.

Petraites brevicristatus: Smith, 1945: 540, 1949: 353, pl. 78 fig. 985.

Description. D. XXXIII-XXXVI (XXXV-XXXVI) 4-7 (5); A. II 21-24; P. 12-14 (12-13); V. I 3; C. 13. Gill-rakers in outer series on first arch 1-2 + 3-4. Vertebrae 17-18 + 27-31. First three dorsal spines elevated to form low crest, fourth dorsal spine 70% to over 90% first dorsal spine. Notch of varying depth in membrane between third and fourth dorsal spines (see table 3). Clusters of 4-6 cirri at tips of all dorsal spines. Pectoral fin rounded. Inner pelvic ray minute. Caudal peduncle short, length 21-34.5% head length, depth 21-28% head length. Caudal fin subtruncate.

Body slightly compressed, covered with small scales extending on to dorsal fin base but not caudal or anal fin bases or head. Depth 4.5-5 in standard length. Head 3.75-4.75 in standard length, snout bluntly rounded. Eye 2.75-3.25 in head. Supraorbital tentacle prominent, with short subcylindrical stalk and round, flattened tip ending in several simple branches. Cirrus on anterior nostril prominent, elongate, flat, and narrow, with slightly indented margin. Upper jaw 40-48.5% head length. Lips fairly thin. Vomer toothed. Sensory pores of head single in nasal and interorbital series and in mandibular series with exception of first, double pore; multiple as well as double pores in supraorbital, postorbital, occipital and preopercular series (fig. 15(b)).

Lateral line of usually about 25 vertical pairs of pores in front (few may be single opening above or below line), to post-pectoral curve, then of short separate horizontal tubes with pore at either end (fig. 15(d)). Intromittent organ of male with fairly long basal portion and single pair of dorso-lateral lips ensheathing base of tip, which is slightly swollen, narrowing terminally (fig. 15(c)).

Colouring. Ground colour usually light grey, with about seven vermilion cross-bars, having shorter brown bars between them. The cross-bars may, however,

be various shades of green, brown, or deep red. The cross-bars extend on to dorsal and anal fins, but membrane joining dorsal soft rays has irregular translucent patches. Caudal and pectoral fins finely barred with dark brown. A 3-shaped dark mark at base of pectoral fin, and a dark stripe from edge of branchiostegal membrane to central edge of pectoral fin base. Operculum with irregular dark mark; two irregular dark bands radiate from eye across cheek. Pelvic fins barred with brown. Belly silvery white to greyish. Head grey or pinkish. Pattern retained for several years after preservation.

Location of type material. South African Museum, Cape Town.

Material examined. 36 specimens, 37.5–106 mm in standard length. 2 from Lambert's Bay, R.U.C.; 1 from Simon's Bay, False Bay, S.A.M. 24243; 1 from Kalk Bay, False Bay, S.A.M. 9988 (holotype); 5 from Dalebrook, False Bay, S.A.M. 23870 and 18/12/1964, S.A.M. not catalogued; 1 from St. James, False Bay, 16/5/1965, S.A.M. not catalogued; 26 from Strandfontein, False Bay' S.A.M. 23871, S.A.M. 23872, S.A.M. 23954, S.A.M. 23971, S.A.M. 23976, S.A.M. 24242.

Remarks. *Clinus brevicristatus* is very similar to the species with a low dorsal fin, such as *Clinus cottoides*, *Clinus acuminatus*, *Clinus venustris*, and particularly *Clinus agilis*. The species was described from a single female specimen from Kalk Bay,

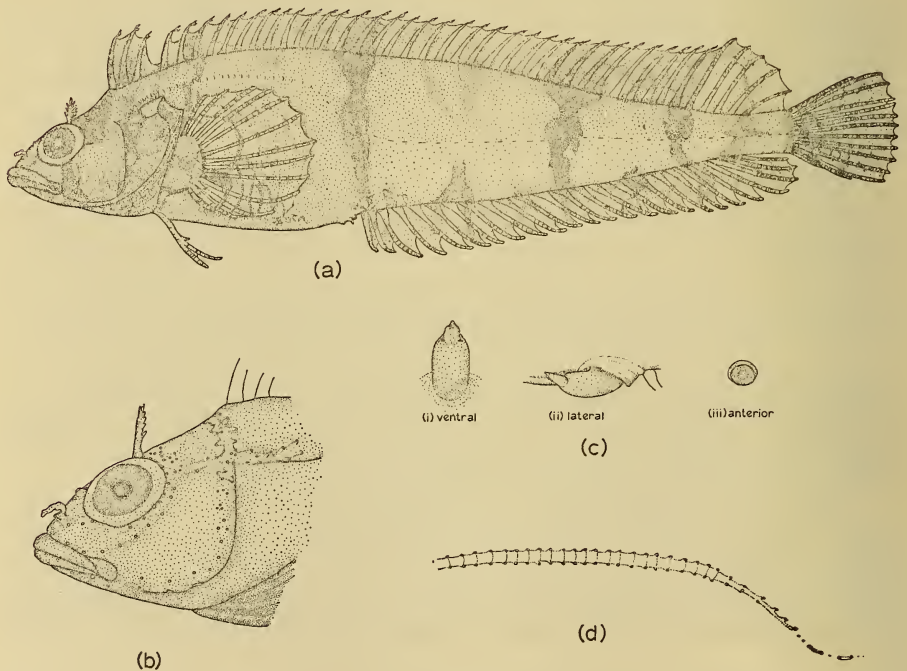


FIG. 15. *Clinus* (*Clinus*) *brevicristatus*: (a) Lateral view, female, 70 mm, S.A.M. 23870; (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

in False Bay. I have collected additional specimens of both sexes from weedy areas at Strandfontein and Dalebrook in False Bay. The new material covers a fairly wide size range. This species is no more similar to *Clinus woodi*, with which it was placed in the genus *Petraites* by Smith (1945), than it is to *Clinus venustris* or *Clinus agilis*; in fact, it resembles the latter two species far more closely. The development of the crest is poor in both male and female specimens of *C. brevicristatus*, unlike that in *Clinus woodi*, in which the crest is high and triangular in both sexes, and almost entirely separate from the rest of the fin. In *Clinus brevicristatus* the crest is low and rounded, and resembles the crest of *Clinus agilis* (with a notch in the membrane between the third and fourth dorsal spines and the first three dorsal spines not elevated) more closely than it does the crest of *Clinus woodi*. *Clinus brevicristatus* does not appear to reach a large size. This species is unusual in the genus *Clinus* in that it lives almost exclusively in weedbeds. The peculiar intromittent organ of *C. navalis* is nearest to that of *C. brevicristatus*, which shows little definition of the thin dorso-lateral lips when fully erect.

Distribution (fig. 11). The known range is from Lambert's Bay ($32^{\circ}04'S.$, $18^{\circ}20'E$) to False Bay ($\pm 34^{\circ}10'S.$, $18^{\circ}50'E$). The species is not common. Smith (1937) gave the range as False Bay to Great Fish Point, but the latter limit was presumably an error, as it was not repeated in Smith's 1945 and 1949 works. Taken at low tide in False Bay from dense beds of the green alga *Caulerpa filiformis*, intertidal.

Clinus (Clinus) cottoides Valenciennes in Cuvier & Valenciennes, 1836
(Fig. 16)

Clinus cottoides Valenciennes in Cuvier & Valenciennes, 1836: 367. Swainson, 1839: 276. Gilchrist & Thompson, 1908: 125. Barnard, 1927: 858.

Blenniomimus cottoides: Smith, 1945: 539, 1949: 353, pl. 78 fig. 983.

Description. D. XXXI-XXXVI (XXXIII-XXXIV) 4-6 (5-6); A. II 21-25; P. 12-14 (12-13); V. I 2-3; C. 13. Gill-rakers in outer series on first arch 2 + 5-6. Vertebrae 15 + 29-31. Dorsal fin low, even, anterior spines shortest; no notch in membrane between third and fourth dorsal spines. Pectoral fin rounded. Inner (third) pelvic ray minute or absent. Caudal peduncle short, length 30.5-34.5% head length, depth 21-26% head length. Caudal fin subtruncate.

Body slightly compressed, tapering markedly towards tail, covered with small embedded scales extending on to dorsal and caudal fin bases but not anal fin base or head. Depth 4.5-5.5 in standard length. Head very large, heavy, 3.25-4.25 in standard length. Snout bluntly rounded. Head becomes heavier in relation to body with age. Eye very large, 2.25-3.5 in head. Interorbital concave, bony ridge above each eye. Deep groove across occiput. Supraorbital tentacle prominent, on bony ridge, with flattened stalk and numerous long filamentous cirri terminally. Cirrus on anterior nostril short, flattened, with

about four short, simple branches terminally. Mouth large, increasing with size of fish, upper jaw 42–60% head length. Lips thin. Vomer toothed. Sensory pores of head single in nasal and interorbital series and on mandible except for first, double pore; mainly double in other series, and some multiple in occipital region (fig. 16(b)). Some pores in supraorbital and occipital regions open on minute papillae.

Lateral line usually of about 18–20 vertical pairs of pores, interspersed with or followed by few single pores opening above or below line, in front to post-pectoral curve, then of short separate horizontal tubes with pore at either end (fig. 16(d)). Intromittent organ of male with fairly long basal portion and single pair of slightly papillose dorso-lateral lips below which tip, which is slightly swollen at base with narrow termination, protrudes (fig. 16(c)).

Colouring. Ground colour slaty grey or dull greenish with irregular mottling, often in lacy pattern with vague crossbars extending on to dorsal and anal fins, chiefly dark grey, dark red, and whitish. Fins dusky, faintly mottled and barred. Three small dark lines on pectoral base. Prominent round black spot on opercle. Dark mark behind centre of eye, below which two narrow dark lines radiate from eye across cheek. Head and lips dusky to slate-grey; terminal filaments of supraorbital tentacles white. Belly white to greyish. Juveniles milky with fine lacy dark markings particularly in upper half of body; opercular spot well defined at all stages. Pattern retained for years after preservation.

Location of type material. Muséum National d'Histoire Naturelle, Paris.

Material examined. 951 specimens, 18–120 mm in standard length. 1 specimen, 63 mm in standard length, Cape, Paris Mus. Cat. No. A2078 (lectotype); 26 from Doring Bay, southern Namaqualand, S.A.M. 24229; 4 from southern Namaqualand, R.U.C.; 101 from Lambert's Bay, S.A.M. 23940; 12 from Lambert's Bay, R.U.C.; 3 from Saldanha Bay, S.A.M. 17914; 1 from Langebaan, S.A.M. 21880; 6 from Mouille Point, Cape Peninsula, 5/5/1965, S.A.M. not catalogued; 42 from Sea Point, S.A.M. 23941, S.A.M. 23942 and 17/2/1965, S.A.M. not catalogued; 1 from Hout Bay, S.A.M. 12013; 2 from Miller's Point, False Bay, S.A.M. 22906, S.A.M. 23937; 164 from Froggy Pond and Miller's Point, False Bay, S.A.M. 23939; 113 from Dalebrook, False Bay, 19/2/1965, 3/3/1965 and 18/4/1965 S.A.M. not catalogued; 25 from St. James, False Bay, S.A.M. 10540; 80 from Strandfontein, False Bay, S.A.M. 23978 and 12/1/1964 and 13/8/1964, S.A.M. not catalogued; 33 from Onrust River Mouth, S.A.M. 23938, S.A.M. 24230; 2 from Hermanus, S.A.M. 18095; 4 from Die Dam, Bredasdorp district, S.A.M. 24510; 59 from Still Bay, S.A.M. 24666; 35 from Mossel Bay, S.A.M. 23947; 4 from Knysna, S.A.M. 24230; 53 from Plettenberg Bay, S.A.M. 23946; 72 from Port Elizabeth, S.A.M. 23945, S.A.M. 23985; 1 from Kidd's Beach, East London, S.A.M. 20564; 14 from Igoda Mouth, East London, S.A.M. 25060; 104 from East London, S.A.M. 23943, S.A.M. 23944, S.A.M. 24228, and S.A.M. 20562; 2 from Gonubie River Mouth, East London, S.A.M. 25061; 2 from Kei Mouth,

S.A.M. 20563; 1 juvenile from Mozambique Island, R.U.C.

Lectotype of Clinus cottoides

I have examined three of the four syntypes of *Clinus cottoides*. Of these three syntypes, one small specimen is identifiable as the species regarded as *Clinus cottoides* in South Africa since the time of Gilchrist & Thompson (1908). The two larger syntypes are examples of a species known as *Clinus taurus* Gilchrist & Thompson. Dr. M. L. Bauchot kindly examined the remaining, dried syntype in the Paris Museum and concluded that it too represented *Clinus taurus*.

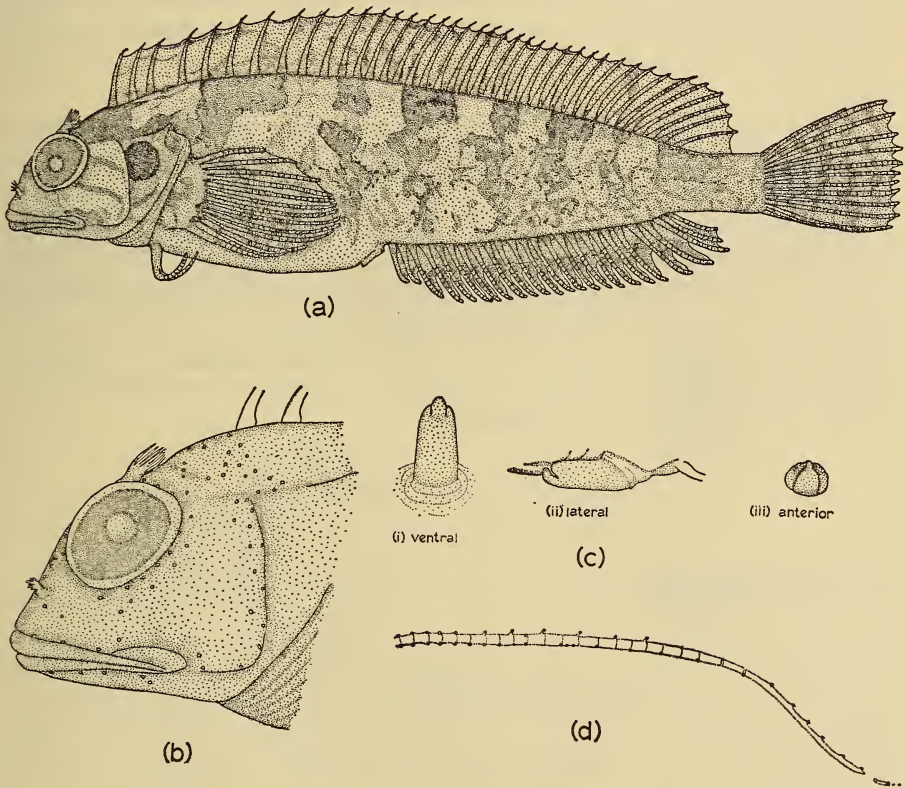


FIG. 16. *Clinus (Clinus) cottoides*: (a) Lateral view, female, 85 mm, S.A.M. 23945; (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

Although Valenciennes (1836 in Cuvier & Valenciennes) almost certainly based his description of *C. cottoides* on the larger specimens, the description applies more or less to both species; and the species was not figured. In order not to complicate the nomenclature of the two species, I here designate the small specimen, 63 mm, Paris Museum Catalogue No. A2078, of the four syntypes of *Clinus cottoides* the lectotype.

Remarks. Smith (1945) considered the concave interorbital of *Clinus cottoides* and of *Clinus taurus* to be of generic significance. However, *Clinus latipennis*, large specimens of *Clinus heterodon*, and to a slight degree *Clinus helenae*, also have a concave interorbital with low bony ridges over the eyes. Instead of a clear-cut division between species with and without a ridge over the eyes, there is a series, from *Clinus heterodon*, in which the supraorbital ridges develop only in large specimens, to *Clinus taurus*, in which the ridges are very heavy at all stages. These species all appear to be closely related to each other and to species lacking the ridge, such as *Clinus acuminatus* and *Clinus berrisfordi*.

Specimens of *Clinus cottoides* from East London were compared with specimens from Lambert's Bay, and no east-west clinal or individual population differences were found in the fin counts of this species. *Clinus cottoides* does, however, attain a considerably greater size on the west coast than it does east of Cape Point.

Distribution (fig. 11). The known range is from southern Namaqualand ($\pm 31^{\circ}40'S.$, $18^{\circ}15'E$) (Olifants River Mouth) to the Kei River ($32^{\circ}41'S.$, $28^{\circ}23'E$). It is one of the most abundant species from Lambert's Bay to the Kei River, particularly from False Bay eastwards. A single tiny juvenile from Mozambique Island was seen in the Rhodes University Ichthyology Department, but this seems to be well outside the normal range for this species, which has not been recorded otherwise much north of the Kei River. *Clinus cottoides* was recorded by Kner (1865-67) from Java, but De Beaufort & Chapman (1955) stated that this record is certainly erroneous; its occurrence outside South African waters is most improbable.

Clinus (Clinus) helenae (Smith, 1945)

(Fig. 17)

Ophthalmolophus helenae Smith, 1945: 542, fig. 3; 1949: 355, pl. 79 fig. 992.

Clinus helenae: Smith, 1966: 73.

Description. D. XXXIV-XXXVII 5-6; A II 24-25; P. 13; V. I 3; C. 13. Vertebrae 16 + 30. Dorsal fin low, even; no notch in membrane between third and fourth dorsal spines. No clusters of cirri at tips of dorsal spines. Pectoral fin rounded. Inner pelvic ray minute. Caudal peduncle short, length, 30-35.5% head length, depth 20-24% head length, noticeably longer than deep. Caudal fin subtruncate.

Body slightly compressed, covered with small embedded scales not extending on to dorsal, anal, or caudal fin bases or head. Depth 4.5-5 in standard length. Head 3.75-4.75 in standard length, snout bluntly rounded. Interorbital slightly concave, low bony ridges over eyes; occipital grooves moderately deep. Eye 3-5 in head. Supraorbital tentacle prominent, with flattened stalk and terminal fringe of long fine filamentous cirri. Cirrus on anterior nostril small, simple, flaplike. Upper jaw 39.5-52.5% head length. Lips moderately thick. Vomer toothed. Sensory pores of head single in nasal, interorbital, and

mandibular series except for first double mandibular pore; double or multiple in other series (fig. 17(b)). Many pores open on raised papillae, giving head a rough appearance.

Lateral line of vertical pairs of pores in front to post-pectoral curve, then of short separate horizontal tubes with pore at either end (fig. 17(d)). Intromittent organ of male with moderately long basal portion; small pair of circular dorsal lips and large pair of ventro-lateral lips with finely serrated ventral margins ensheathing tip. Small pair of lateral lobes on basal portion (fig. 17(c)).

Colouring. A single fresh specimen from Kei Mouth was light grey, with darker mottling in the form of irregular cross-bars; body and head speckled with white. Smith (1945) described the colouring of his specimens as 'light brown, with seven darker broken crossbands. Darker spots and speckles on head and body.'

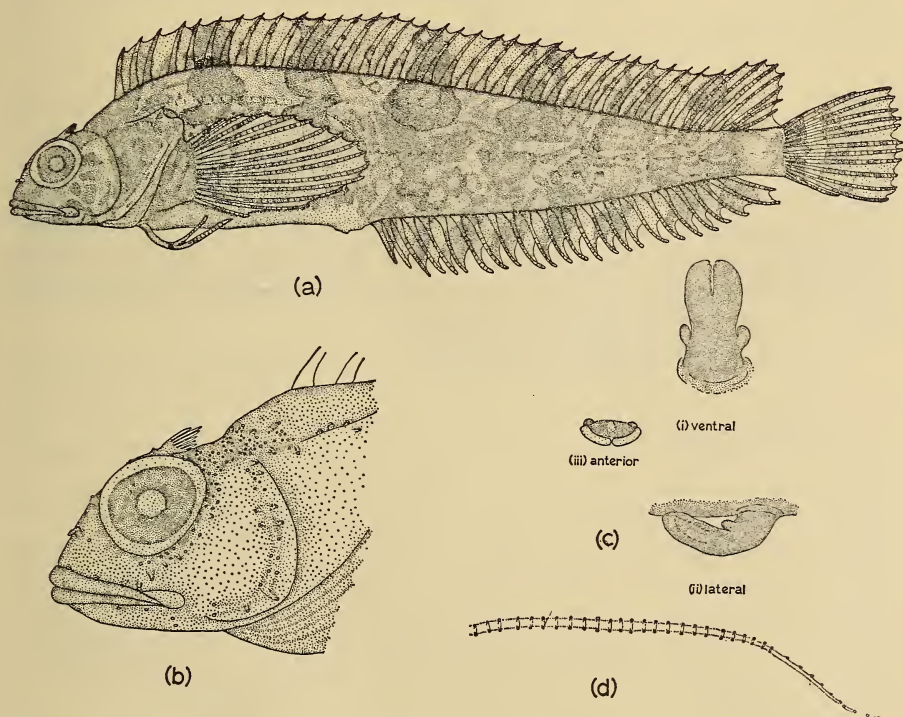


FIG. 17. *Clinus* (*Clinus*) *helenae*: (a) Lateral view, female, 71 mm, S.A.M. 25065; (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

The fins are finely spotted and barred. Pattern retained for years after preservation.

Location of type material. Department of Ichthyology, Rhodes University, Grahamstown.

Material examined. 8 specimens, 67.5–78.5 mm in standard length. 4 from

Boknes Point, R.U.C. (syntypes); 3 from Cape Morgan, R.U.C. (syntypes); 1 from Kei mouth, S.A.M. 25065.

Remarks. *Clinus helenae* resembles *Clinus cottoides*, *Clinus taurus* and particularly *Clinus latipennis* in the form of the head, although the concave interorbital is least marked in *Clinus helenae*. It is also similar to *Clinus heterodon* (in which the interorbital becomes concave only in large specimens), *Clinus berrisfordi* and *Clinus acuminatus*. The intromittent organ is similar to that of *Clinus latipennis*, the only other species which has a pair of subsidiary lobes on the basal portion.

Distribution (fig. 11). The known range is Port Alfred ($33^{\circ}36'S.$, $26^{\circ}54'E$) to the Bashee River ($31^{\circ}55'S.$, $28^{\circ}27'E$); rare.

Clinus (Clinus) heterodon Valenciennes in Cuvier & Valenciennes, 1836
(Fig. 18)

Clinus heterodon Valenciennes in Cuvier & Valenciennes, 1836: 394.

Clinus obtusifrons Penrith, 1967: 46, figs 2, 4(b).

Description. D. XXX-XXXII (XXX-XXXI) 6-7; A. II 20-22 (20-21); P. 13; V. I 2-3; C. 13. Gill-rakers in outer series on first arch 1-2 + 5-6. Vertebrae 16 + 27-30. First three dorsal spines not forming crest, but equal to or a little longer than fourth spine, second spine longest. No notch in membrane between third and fourth dorsal spines. No clusters of cirri at tips of dorsal spines. Pectoral fin rounded. Inner (third) pelvic ray minute or absent. Caudal peduncle short, length 20-35% head length, depth 25-37.5% head length. Caudal fin subtruncate.

Body slightly compressed, covered with small embedded scales extending on to dorsal and caudal fin bases; anal fin base and head naked. Depth 4-5 in standard length. Head heavy, 3.2-4.5 in standard length. Interorbital concave with low supraorbital ridges in large specimens. Snout bluntly rounded, angle of profile obtuse. Eye 3-4.5 in head. Supraorbital tentacle prominent, with flattened stalk, terminating in several short, simple branches. Cirrus on anterior nostril flattened, expanded, and roughly triangular at tip. Upper jaw 36.4-50% head length, increasing with size of fish. Lips moderate. Vomer toothed. Sensory pores of head single in nasal and interorbital series, mainly single in mandibular, suborbital, and preopercular series. Mainly double and multiple in remaining series (fig. 18(b)). A few pores in occipital region open on raised papillae.

Lateral line of single pores, opening above or below line, in front to post-pectoral curve, then of short separate horizontal tubes with pore at either end (fig. 18(d)). Intromittent organ of male with moderately long basal portion and slender, upwardly hooked tip between pair of lateral lips and small rounded pair of dorsal lips (fig. 18(c)).

Colouring. Dusky or slaty with darker grey, irregular, lacy cross-bars, speckled with white and sometimes dark blue when fresh. Tips of anal and pelvic rays red. Prominent blue-edged spot on shoulder. Two dark radiating bars across

cheek. Tips of dorsal fin and orbital tentacles white. Pattern retained for years after preservation.

Location of type material. Muséum National d'Histoire Naturelle, Paris.

Material examined. 113 specimens, 20–116 mm in standard length. 1 specimen, Cape, Paris Museum Cat. No. A 1885 (holotype); 1 from Milestone 26, north of Swakopmund, S.A.M. 24201; 2 from Lüderitzbucht, S.A.M. 24211; 1 from Sinclair's Island, August 1947, R.U.C.; 12 from Port Nolloth, S.A.M. 24216, 5 from Port Nolloth, 27/4/1950 R.U.C.; 4 from Hondeklip Bay, S.A.M. 24671, S.A.M. 24670 (holotype and paratypes of *obtusifrons*); 1 from Hondeklip Bay, 28/4/1960, R.U.C.; 3 from Gert du Toit Bay, southern Namaqualand, S.A.M. 24253; 1 from Doring Bay, southern Namaqualand, 26/4/1960, R.U.C.; 58 from Lambert's Bay, R.U.C.; 3 from Ysterfontein, 20/2/1948, R.U.C.; 7 from Sea Point, S.A.M. 25068; 6 from False Bay, March 1947, R.U.C.; 8, no locality, R.U.C.

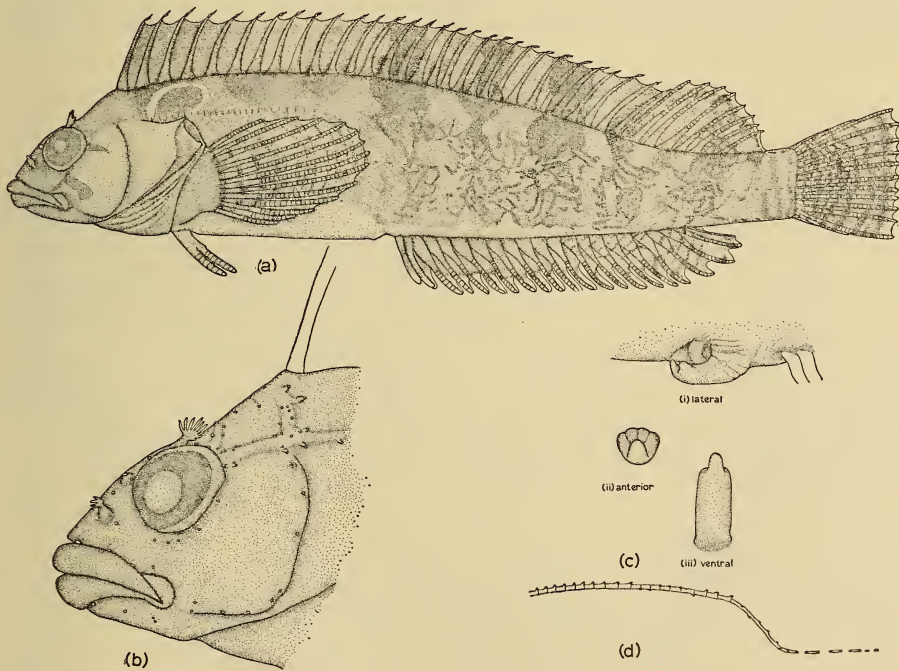


FIG. 18. *Clinus (Clinus) heterodon*: (a) Lateral view, female, 124 mm, S.A.M. 24671; (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

Remarks. The re-examination of Valenciennes' types indicated that the type-specimen of the species that he named *heterodon* was a tentacled clinid referable to the genus *Clinus*. It is in no way identifiable with the species for which the name *heterodon* has been used in South African literature since Barnard (1927)

identified it as such from Valenciennes' very brief description. The description is very inadequate and, translated, reads 'I did not see a tentacle over the eye . . .'. It has naturally been assumed, as it happens, incorrectly, that the specimen he examined did not have a tentacle over the eye. Gilchrist & Thompson (1908) did not identify any of the South African species they collected and described with Valenciennes' *C. heterodon*. However, Barnard (1927), assuming the lack of a supraorbital tentacle, and using the dorsal and anal fin counts given by Valenciennes for *C. heterodon*, identified a species of weed-dwelling clinid described by Gilchrist & Thompson under the name *Clinus graminis* as Valenciennes' *heterodon*. This identification has been followed by subsequent workers, so that the name *heterodon* has come to be applied to a species of the genus *Pavoclinus* (Smith, 1945, 1949).

The species to which Valenciennes' type and description of *C. heterodon* refer is fairly common on the west coast of South Africa.

Owing to its superficial similarity in fin counts to *C. acuminatus* it was not rediscovered until recently, and was described as a new species *Clinus obtusifrons* (Penrith, 1967). However, since my specimens of *obtusifrons* agree in every

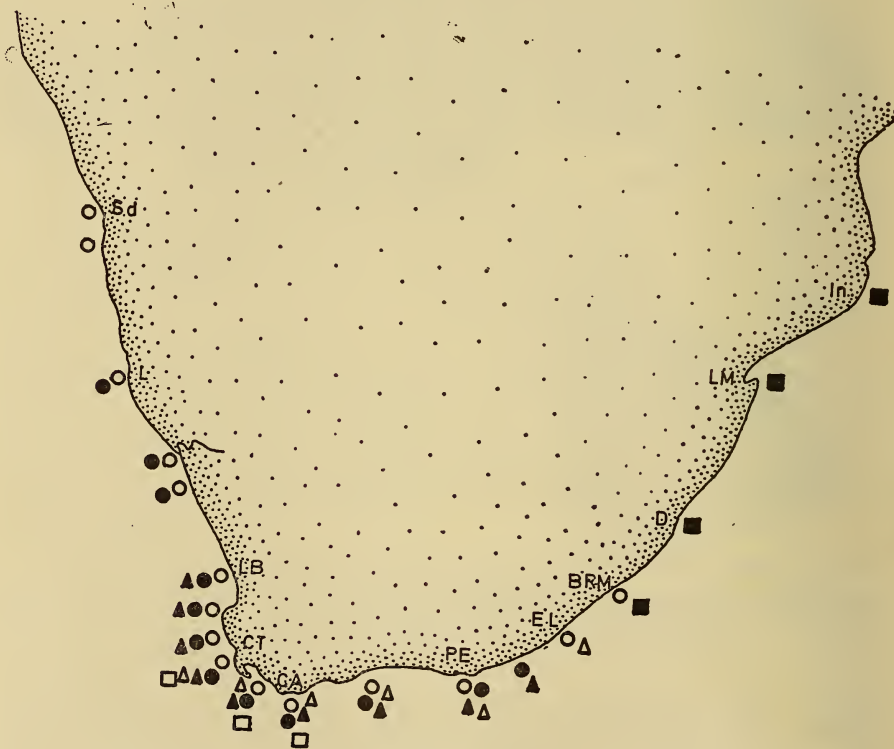


FIG. 19. Distribution of *C. latipennis* (open squares), *C. robustus* (open triangles), *C. superciliosus* (open circles), *C. taurus* (closed triangles), *C. venustris* (closed circles), *C. woodi* (closed squares).

way with Valenciennes' holotype of *C. heterodon*, the name *heterodon* must replace *obtusifrons*. The name *graminis* Gilchrist & Thompson is revived for the species that has been masquerading under the name of *heterodon* in the South African literature.

Clinus heterodon has very similar dorsal counts to *Clinus acuminatus*, but can be distinguished from that species by the shape of the intromittent organ, the shape of the snout and profile, the height of the first three dorsal spines, the greater width of the interorbital, and the number of pectoral rays. Large specimens of *Clinus obtusifrons* can be distinguished from *Clinus acuminatus* by the concave interorbital and the supraorbital ridges. The intromittent organ is similar to the type found in *Clinus berrisfordi*, *Clinus cottoides*, and *Clinus brevicristatus*.

Distribution (fig. 11). The known range is from north of Swakopmund ($22^{\circ}40'S$, $14^{\circ}34'E$) (South West Africa) to False Bay ($\pm 34^{\circ}10'S$, $18^{\circ}50'E$). The species is fairly common in pools in the middle and lower regions of the intertidal zone on the coast west of Cape Point, particularly from the Olifants River to the Orange River, but is extremely rare in False Bay.

Clinus (Clinus) latipennis Valenciennes in
Cuvier & Valenciennes, 1836
(Fig. 20)

Clinus latipennis Valenciennes in Cuvier & Valenciennes, 1836: 394. Barnard, 1927: 860. Hubbs, 1952: 106. Smith, 1966: 73.

Clinus latipinnis: Gilchrist & Thompson, 1908, 127.

Labrisomus latipennis: Swainson, 1839: 277.

Ophthalmolophus latipinnis: Gill, 1860: 104. Smith, 1945: 542.

Ophthalmolophus latipennis: Smith, 1949: 355, fig. 993.

Description. D. XXXIII-XXXVI 8-9; A. II 23-26; P. 13-14; V. I 2-3; C. 13. Vertebrae 17 + 30-33. Dorsal fin low, even; no notch in membrane between third and fourth dorsal spines. No clusters of cirri at tips of dorsal spines. Pectoral fin rounded. Inner pelvic ray minute or absent. Caudal peduncle short, length 27.5-33.3% head length, depth 20-33% head length. Caudal fin subtruncate.

Body slightly compressed, covered with small embedded scales extending on to dorsal fin base; caudal and anal fin bases and head naked. Depth 4.85-5.2 in standard length. Head 3.5-5.5 in standard length, snout bluntly rounded. Interorbital grooves moderately deep. Eye 3.2-4.6 in head. Supra-orbital tentacle prominent, with flattened stalk, expanded tip, and terminal fringe of fine filamentous cirri. Cirrus on anterior nostril flattened, narrow at base with expanded trilobate tip. Upper jaw 35-43.5% standard length. Lips moderately thin. Vomer toothed. Sensory pores of head single in nasal and interorbital series, single except for first pore in mandibular series, and double in preopercular series; double or multiple in remaining series (fig. 20(b)). Many pores open on papillae, giving head a rough appearance.

Lateral line of vertical pairs of pores in front to post-pectoral curve, then of

short separate horizontal tubes with pore at either end (fig. 20(d)). Intromittent organ of male with moderately long basal portion and swollen tip ensheathed by pair of large, flattened ventral lobes and small flattened dorsal lobe. Three lobes at base of organ, two lateral rounded ones and one dorsal flattened lobe (fig. 20(c)).

Colouring. Pinkish brown with faint irregular darker mottling and speckling. Fins whitish, dorsal with about seven dark cross bars not reaching upper edge of fin. Pectoral and caudal fins with clusters of small black dots forming irregular spots. Head grey-brown, mottled. A few white spots on pectoral base and along sides. Pattern remains for a long time after preservation.

Location of type material. Muséum National d'Histoire Naturelle, Paris.

Material examined. 7 specimens, 47–102 mm in standard length. 3 specimens, Cape, Paris Museum Cat. Nos. A2010, A2011, A2012 (syntypes); 1 from St. James, S.A.M. 10533; 2 from Die Dam, Bredasdorp district, S.A.M. 25066; 1 from Fish Hoek, December, 1966, S.A.M. 25067.

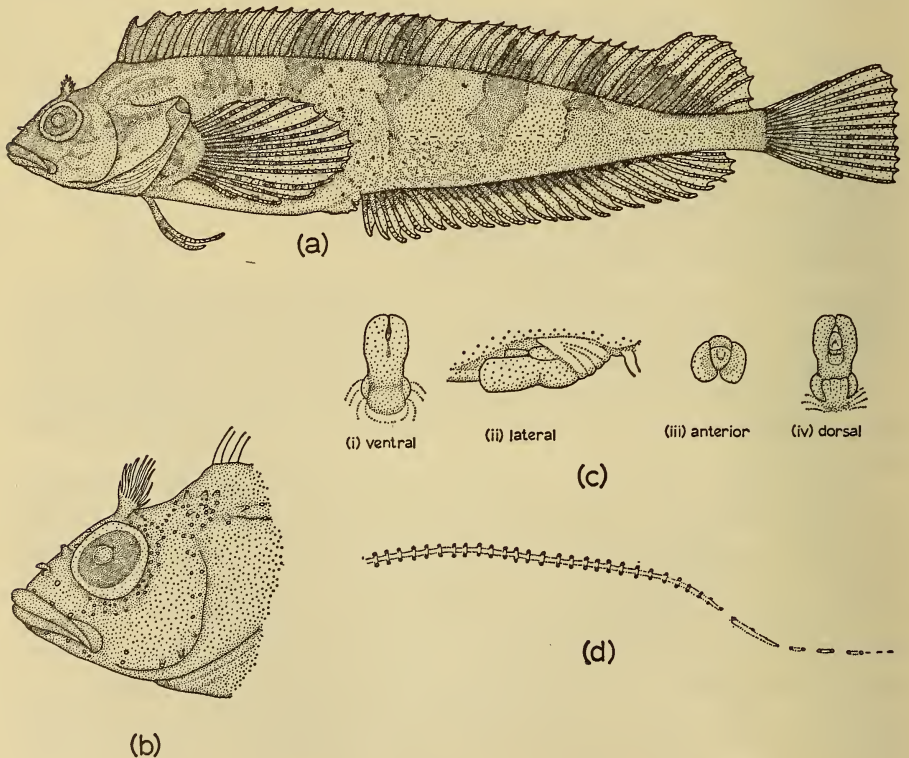


FIG. 20. *Clinus (Clinus) latipennis*: (a) Lateral view, female, 82 mm, S.A.M. 25066; (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

Remarks. This species is poorly known, although it was one of the earliest described South African Clinidae. There are four specimens in the South African Museum, three of which were acquired recently, so that fresh material was available for study. This species is extremely similar to *Clinus helenae*, particularly in the occurrence of basal lobes around the intromittent organ. It is distinguished from *Clinus helenae* in having more dorsal soft rays. It is very similar in appearance to *Clinus cottoides*.

Distribution (fig. 19). The known range is from Table Bay ($\pm 33^{\circ}45'S.$, $18^{\circ}20'E$) to Cape Agulhas ($34^{\circ}50'S.$, $20^{\circ}00'E$); rare.

Clinus (Clinus) robustus Gilchrist & Thompson, 1908

(Fig. 21)

Clinus robustus Gilchrist & Thompson, 1908: 128. Barnard, 1927: 850. Smith, 1945: 541, 1949: 354, pl. 81 fig. 987 and fig. 987.

Clinetrachus robustus: Hubbs, 1952: 107.

Caboclinus robustus: Smith, 1966: 73.

Description. D. XXXII-XXXIV (XXXIII) 9-14 (10-11); A. II 26-28 (26-27); P. 12; V. I 3; C. 13. Gill-rakers in outer series on first arch 1-2 + 4-5. Vertebrae 17 + 33. First three dorsal spines slightly elevated, forming low crest, second spine longest (first dorsal spine 0.5-4 mm longer than fourth dorsal spine). Shallow notch in membrane between third and fourth dorsal spines, depth variable (see table 3). Anterior dorsal spines with clusters of 3-4 cirri at tips. Inner pelvic ray well developed, as least half length and thickness of other rays. Caudal peduncle short, length 25-33.3% head length, depth 24-30% head length. Caudal fin subtruncate.

Body slightly compressed, covered with small embedded scales extending on to bases of dorsal and caudal fins but not anal fin base or head. Depth 4.5-5.5 in standard length. Head large, heavy, 3.25-4 in standard length, snout bluntly rounded in large specimens, somewhat subconical in smaller ones. Eye 5-7.5 in head. Supraorbital tentacle prominent, with flattened stalk and expanded flat tip, terminating in several short, flat, simple branches. Cirrus on anterior nostril somewhat elongate, narrower at base, margin irregularly indented. Mouth large, upper jaw 45.5-53.5% head length. Lips thick, with distinct vertical corrugations. Vomer toothed. Sensory pores of head double or multiple in suborbital, supraorbital, and occipital regions, otherwise mostly single (fig. 21(b)).

Lateral line of vertical pairs of pores and single pores opening above and below the line in front to post-pectoral curve, then of short separate horizontal tubes with pore at either end (fig. 21(d)). Intromittent organ of male with moderately long basal portion and two pairs of lips ensheathing tip, small rounded dorsal pair and large ventro-lateral pair, latter with finely serrate ventral margins (fig. 21(c)).

Colouring. Variable, olive yellow to dusky, with speckling in dark olive, red,

black, green, and white, forming obscure crossbars continuing on to dorsal and anal fins, or dark greyish brown with vague mottling. Sometimes a few bright orange speckles along anterior part of lateral line. Pectoral, pelvic, and caudal fins barred. Dorsal, anal, and pelvic fins red- or orange-tipped. Usually two dark radiating lines from eye across cheek. Uniform yellowish preserved in alcohol.

Location of type material. South African Museum, Cape Town.

Lectotype. Female, 280 mm standard length, Seal Island, False Bay, S.A.M. 10539.

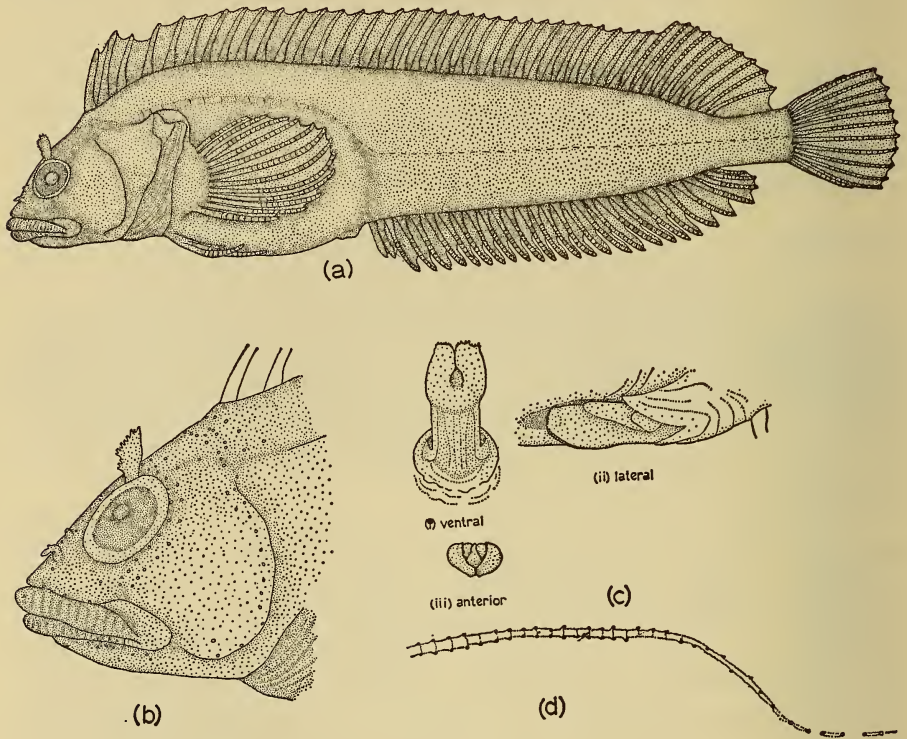


FIG. 21. *Clinus (Clinus) robustus*: (a) Lateral view, female, 121 mm, S.A.M. 23878; (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

Material examined. 12 specimens, 123–314 mm in standard length. 1 from Melkbosch, S.A.M. 24072; 8 from Kalk Bay, False Bay, S.A.M. 10537, S.A.M. 10538 (paralectotypes), S.A.M. 10539 (lectotype), S.A.M. 18087; 2 from Dalebrook, False Bay, S.A.M. 23873; 1 from St. James, False Bay, S.A.M. 12019.

Remarks. Although Smith (1945), and following him Hubbs (1952), treated *Clinus robustus* as if it were very close to *Clinus superciliosus*, the similarity in size

and habit between these two species probably accounted for this as much as actual resemblance, as the two species are not easily confused. *Clinus robustus* appears to be a rather primitive and generalized species; it is at least as closely related to forms such as *Clinus taurus* and *Clinus agilis* as to *Clinus superciliosus*, and at smaller sizes bears a superficial resemblance to large specimens of *Clinus acuminatus*.

Distribution (fig. 19). The known range is west coast of the Cape Peninsula ($34^{\circ}21'S.$, $18^{\circ}29'E$) to East London ($33^{\circ}00'S.$, $27^{\circ}54'E$). Fowler (1934) recorded this species from Natal, but its occurrence there is most improbable. The validity of all Fowler's (1934) clinid records is doubtful. Infratidal except in the young stages. Appears to be rare.

Clinus (*Clinus*) *superciliosus* (Linnaeus, 1758)

(Fig. 22)

Blennius superciliosus Linnaeus, 1758: 257.

Blennius mustelaris Linnaeus, 1758: 257. Gronovius, *ed.* Gray, 1854: 98 (*mustelaris*).

Blennius punctulatus Lacépède, 1800: 460.

Blennius mustela Lacépède, 1800: 459.

Blennius spadiceus Bloch & Schneider, 1801: 172.

Blennius capensis Forster, in Bloch & Schneider, 1801: 175.

Clinus superciliosus: Cuvier, 1817: 173. Valenciennes in Cuvier & Valenciennes, 1836: 360.

Gilchrist & Thompson, 1908: 113. Thompson, 1918: 149. Barnard, 1927: 855. Smith, 1945: 541, 1949: 354, pl. 77 fig. 986 and fig. 986.

Clinitrachus superciliosus: Swainson, 1839: 276. Hubbs, 1952: 106 (*Clinetrachus*).

Blennius versicolor Pappe, 1853: 27.

Blennius mycterizans Gronovius, *ed.* Gray, 1854: 97.

Blennius ignobilis Gronovius, *ed.* Gray, 1854: 96.

Clinus dubius Castelnau, 1861: 51.

Clinus pantherinus Castelnau, 1861: 52.

Clinus marmoratus Castelnau, 1861: 52.

Clinus ornatus Gilchrist & Thompson, 1908: 116.

Clinus superciliosus var. *arborescens* Gilchrist & Thompson, 1908: 115.

Caboclinus superciliosus: Smith, 1966: 73.

Doubtful synonym: *Blennius varius* Seba, 1758: 90, 93.

Description. D. XXXI–XLII (XXXIV–XXXVI) 5–10 (7–8); A. II 21–30 (24–27); P. 15–18 (15–16); V. I 2; C. 13. Gill-rakers in outer series on first arch 2–3 + 7–8. Vertebrae 18 + 30–32. Dorsal fin with first three spines considerably elevated to form crest, higher in mature males than in females and juveniles (table 5). Notch of varying depth in membrane between third and fourth dorsal spines (table 3). Pectoral fin rounded. Third pelvic ray invariably absent; present in two specimens of whole sample examined. Caudal peduncle short, length 24–26.5% head length, depth 29–33.5% head length. Caudal fin subtruncate. Clusters of cirri usually present at tips of first three dorsal spines.

Body slightly compressed, covered with small embedded scales, more or less overlapping at least on front half of body, extending on to dorsal and caudal fin bases; anal fin base and head naked. Depth 4–5 in standard length. Head 3.25–4 in standard length, snout conical to rounded in large specimens. Eye

2.5–3.75 in head. Supraorbital tentacle variable, usually small, with narrow subcylindrical stalk and flattened spatulate tip with a few short, simple branches, but occasionally more prominent, with fairly long subcylindrical stalk giving off many fine filamentous branches towards tip. Cirrus on anterior nostril small, flaplike. Upper jaw 33–55.5% head length, increasing with increase in standard length. Lips thick. Vomer toothed. Sensory pores of head mostly single, double in occipital and supraorbital series (fig. 22(b)).

Lateral line of single and few vertical pairs of pores in front to post-pectoral curve, then of short separate horizontal tubes with pores at either end (fig. 22(d)). Intromittent organ of male with moderately long basal portion and tip ensheathed by complicated skinny fold, presumably derived from confluent ventral lips, with two flat dorsal lips above; appears square when retracted (fig. 22(c)).

Colouring. Very variable. Usually mottled and blotched pattern with conspicuous dark, roughly diamond-shaped blotches, lighter in centre, along base of, and continued on to, dorsal fin. Ground colour usually buff or grey, with red and darker mottling, but plain scarlet, crimson, bronze and green specimens with fine black speckling, and red, bright green, or olive specimens with the usual pattern in a darker shade occur. A round dark spot, which may appear metallic blue when fresh, on dorsal crest. Head dark above, barred and reticulated below with longitudinal stripes of lighter and darker shades, rising from lips to eye and curving down again across cheek. Dark, comma-shaped mark on opercle. Belly mainly white; may have reticulate markings. Branchiostegal membranes with reticulate markings. Fins irregularly barred; often with bright red and orange markings in mature males. Juveniles milky with faint dark marks along dorsal base. Pattern remains for years after preservation.

Location of type material. Unknown.

Material examined. 1,118 specimens, 29–251 mm in standard length. 57 from Swakopmund and Milestone 26, S.A.M. 24200; 56 from Walvis Bay, S.A.M. 1381, S.A.M. 9866, S.A.M. 24203; 127 from Lüderitzbucht, S.A.M. 24204; 28 from Port Nolloth, S.A.M. 24215; 1 from Kleinsee, Namaqualand, S.A.M. 18225; 17 from Hondeklip Bay, March 1965, S.A.M. not catalogued; 53 from Gert du Toit Bay and Doring Bay, southern Namaqualand, S.A.M. 24225; 417 from Lambert's Bay, S.A.M. 23905, S.A.M. 23914; 4 from Hoetjies Bay, Saldanha Bay, S.A.M. 9868, S.A.M. 9869; 9 from Saldanha Bay, S.A.M. 23970, S.A.M. 23911; 4 from Robben Island, Table Bay, S.A.M. 9859; 3 from Green Point, Cape Peninsula, S.A.M. 22779; 88 from Sea Point, S.A.M. 23912, S.A.M. 23915, and 17/2/1965, S.A.M. not catalogued; 1 from Hout Bay, Cape Peninsula, S.A.M. 23908; 2 from Kommetjie, Cape Peninsula, S.A.M. 9865; 32 from Froggy Pond and Miller's Point, False Bay, S.A.M. 23910; 8 from Kalk Bay, False Bay, S.A.M. 9875 (syntype of *ornatus*); 11 from Dalebrook, False Bay, S.A.M. 23913, S.A.M. 23916, S.A.M. 23917 and 18/4/1965 and 16/5/1965, S.A.M. not catalogued; 41 from Strandfontein, False Bay, S.A.M. 23977,

S.A.M. 24223; 10 from Strandfontein and Dalebrook, 19/2/1965, S.A.M. not catalogued; 9 from False Bay, S.A.M. 9871, S.A.M. 9872, S.A.M. 9873 (syntypes of var. *arborescens*), S.A.M. 9874 (syntype of *ornatus*); 51 from Onrust River Mouth, S.A.M. 23904, S.A.M. 24226; 13 from Die Dam, Bredasdorp district, S.A.M. 24507, S.A.M. 24547; 10 from Still Bay, S.A.M. 25070; 2 from Mossel Bay, S.A.M. 23909; 5 from Knysna (Leisure Isle and the Heads) S.A.M. 24227; 44 from Port Elizabeth, S.A.M. 23918, S.A.M. 23986, S.A.M. 24224; 2 from Kidd's Beach, East London, S.A.M. 25069; 3 from Kei Mouth, S.A.M. 25071.

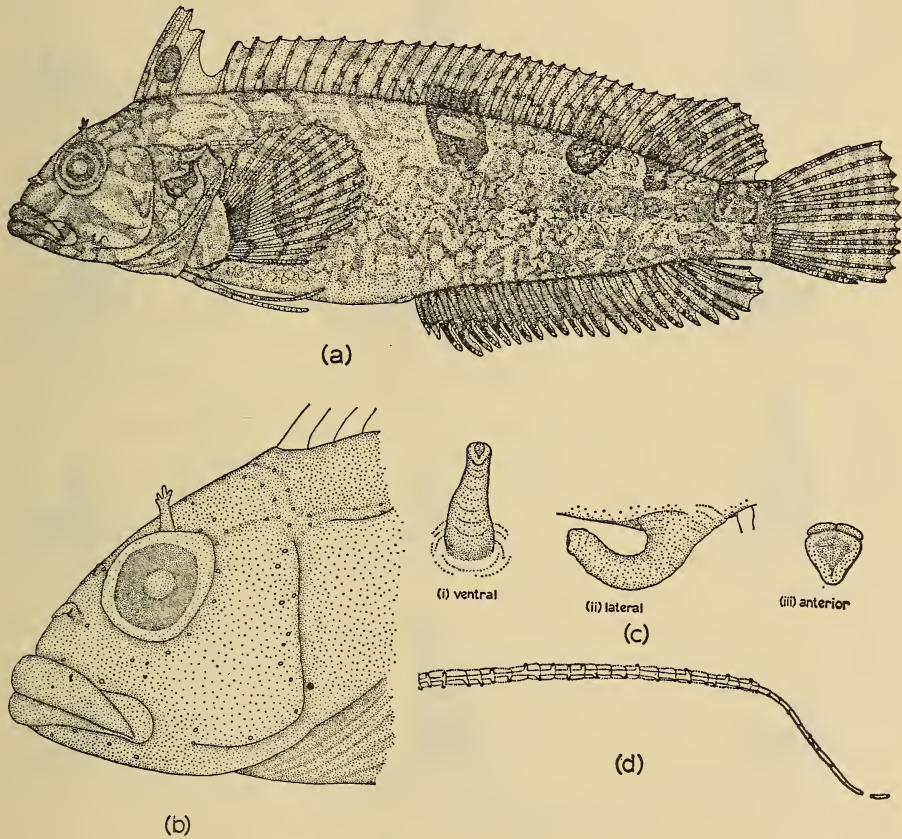


FIG. 22. *Clinus* (*Clinus*) *superciliosus*: (a) Lateral view, male, 82.5 mm, S.A.M. 23907; (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

Remarks. *Clinus superciliosus* is the most abundant South African clinid, and also, as suggested by the extensive synonymy, the most variable. *Clinus ornatus* was described by Gilchrist & Thompson (1908) for nine mature male specimens from Table Bay; these specimens had rather different markings from the typical

form, a better developed supraorbital tentacle, and the dorsal fin originating further forward than in the usual variety (see table 6). It seems that, as stated by Smith (1945), these specimens are simply an unusual variety of male *Clinus superciliosus*, and unless females and juveniles can be found to correspond with the *ornatus* males, they must be included in the species *superciliosus*. This species shows a stronger tendency to sexual dimorphism than the other South African clinid species, since, apart from the intromittent organ, the crest is

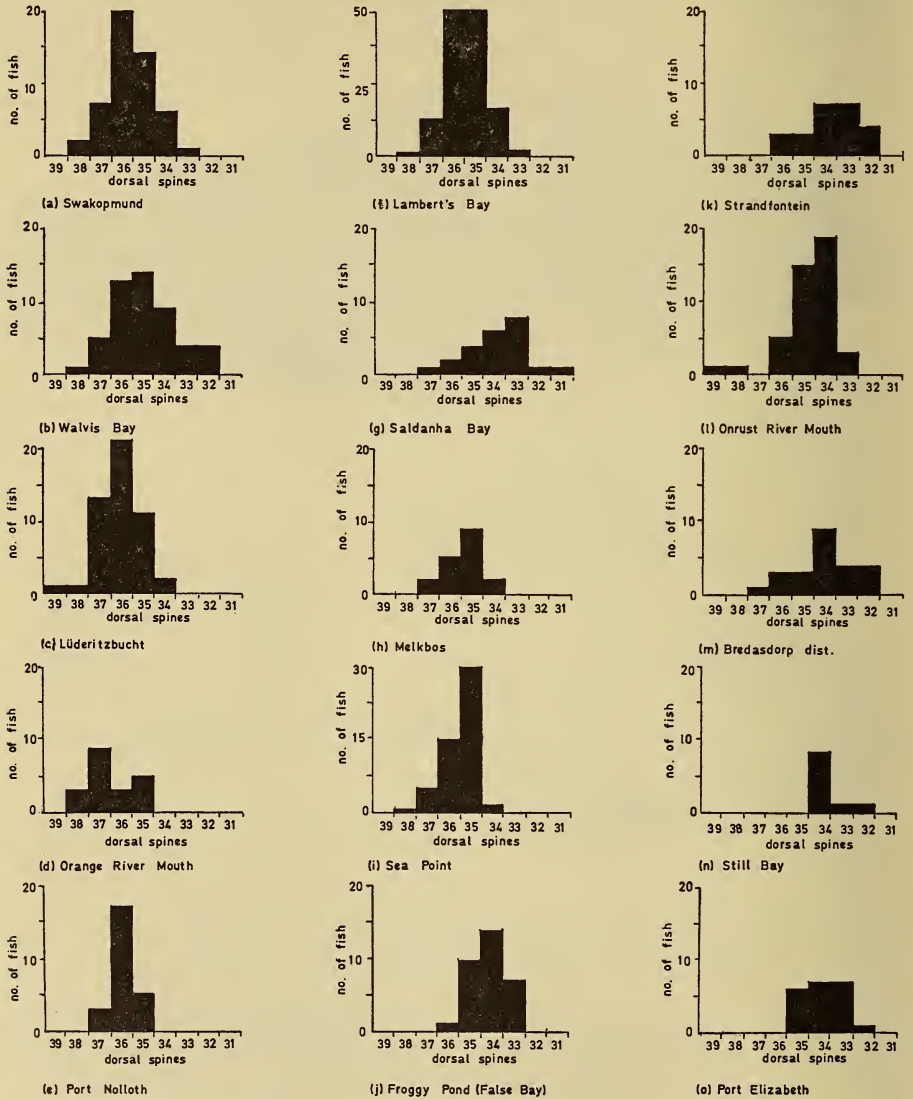


FIG. 23. Histogram showing dorsal spine count variation in different populations of *C. superciliosus*.

much higher in mature males than in females or juveniles, a condition not found in any of the other crested South African species (see table 5).

A variety of *Clinus superciliosus*, *C.s. arborescens*, was also described by Gilchrist & Thompson (1908) for specimens which have the larger, more filamentous type of tentacle over the eye, but this also appears to develop only in some mature males. A few specimens with tentacles of the *arborescens* type were taken in a large sample obtained from Onrust River mouth (January, 1963), and there were no other differences between them and the other specimens of the sample.

Clinus superciliosus resembles *Clinus woodi* most closely of all the species of *Clinus*, but has higher fin counts, and the dorsal fin origin further back (table 6). The crest of *Clinus woodi*, which is also high and well developed, does not appear to show sexual dimorphism. *Clinus superciliosus* resembles *Clinus robustus* mainly in the size attained and the habitat in which it occurs.

In a study of large samples of *Clinus superciliosus*, two variations that may be related to distribution have become apparent. The height of the crest of mature males appears to be greater east of Cape Point and the number of dorsal spines tends to be lower. The latter is shown in fig. 23. The crest requires further study, as no large mature males were obtained east of Hermanus, but there was a marked difference between Hermanus district specimens and specimens from Lambert's Bay, St. Helena Bay, Saldanha Bay and Sea Point on the coast west of the Cape Peninsula. Jackson (1950) also noted the occurrence of such variation in *Clinus superciliosus*, but did not give measurements. The fin counts, which do not vary with the size of the fish, show distinct variation from one population to another (fig. 23), and the east coast populations show on average a lower number of dorsal spines than the west coast populations.

Distribution (fig. 19). The known range is Rocky Point (18°59'S., 12°29'E.) (South West Africa) to the Kei River (32°41'S., 28°23'E.). The species is exceedingly common from Swakopmund to Port Elizabeth and less common northwards from Swakopmund and eastwards from Port Elizabeth. Intertidal and infratidal. Linnaeus (1758) gave the type locality as India, but as his description seems to pertain to the South African species described above, the locality he gave is certainly erroneous.

TABLE 5. Height of dorsal crest in *Clinus superciliosus*
Height of crest (% of standard length)

	10-12.9%	13-15.9%	16-18.9%	>19%
Females (no. of fish)	63	6	0	0
Juvenile males (no. of fish)	25	21	0	0
Mature males (no. of fish)	2	6	17	32

TABLE 6. Comparison of *Clinus superciliosus* (mature males) 'ornatus' males, and *Clinus woodi* (males and females) (Abbreviations: S.L. = standard length; H.L. = head length; Snt. = snout; D.O. = dorsal fin origin).

	S.L. (mm)	H.L. as % of S.L.	Snt.-D.O. as % H.L.
<i>superciliosus</i>	163	25.2	78.0
	165	26.6	79.5
	103	26.7	80.0
	112	24.0	96.5
	131	26.0	76.5
'ornatus'	70	24.2	67.5
	88.5	24.8	68.0
	72	25.7	70.5
	151	23.2	70.0
	166.5	22.8	70.0
	141	24.0	66.0
	177	23.8	62.0
	167	22.8	68.5
<i>woodi</i>	81	28.4	61.0
	96	29.2	59.0
	95	27.4	54.0
	112	27.6	61.0
	146	27.0	58.0

Clinus (Clinus) taurus Gilchrist & Thompson, 1908
(Fig. 24)

Clinus taurus Gilchrist & Thompson, 1908: 126. Barnard, 1927: 858.

Blenniomimus taurus: Smith, 1945: 539, 1949: 353, pl. 78 fig. 982.

Description. D. XXX-XXXVI (XXXII-XXXIV) 5-6; A. II 20-24 (21-23); P. 12; V. I 2-3; C. 13. Gill-rakers in outer series on first arch 3-4 + 7-8. Vertebrae 16 + 28-30. Dorsal fin low, even. Notch in membrane between third and fourth dorsal spines (table 3). No clusters of cirri at tips of dorsal spines. Pectoral fin rounded. Inner pelvic ray minute or absent. Caudal peduncle short, length 20-32% head length, depth 21-23.5% head length. Caudal fin subtruncate.

Body slightly compressed, tapering towards tail, covered with small embedded scales extending on to dorsal and caudal fin bases but not on to anal fin base or head. Depth 4-5 in standard length. Head very heavy, 3.5-4.25 in standard length. Snout bluntly rounded. Interorbital markedly concave, heavy bony ridges over eyes. Occipital groves deep. Eye 3-4.5 in head. Supraorbital tentacle prominent, with flattened stalk and terminal fringe of fine cirri, filamentous. Cirrus on anterior nostril small, flattened, flaplike. Mouth large, upper jaw 42-53% head length. Lips moderately thin. Vomer toothed. Sensory pores of head single in nasal and mandibular series except first, double mandibular pore; multiple in all other series (fig. 24(b)). Most pores open on raised papillae; head very rough.

Lateral line of vertical pairs of pores, with multiple pores in front to postpectoral curve, then of short separate horizontal tubes with pore at each end

(fig. 24(b)). Intromittent organ of male with fairly long basal portion; pair of crescentic dorsal lips and pair of rounded, confluent ventral lips ensheathing slender tip (fig. 24(c)).

Colouring. Ground colour in the fresh specimens examined pale green or yellow, with about seven heavy dark brown cross-bars; head mottled with lilac. Fins orange-tipped. Plain yellow preserved in alcohol.

Location of type material. South African Museum, Cape Town.

Lectotype. Male, 154 mm standard length, St. James, no other data, S.A.M. 10451.

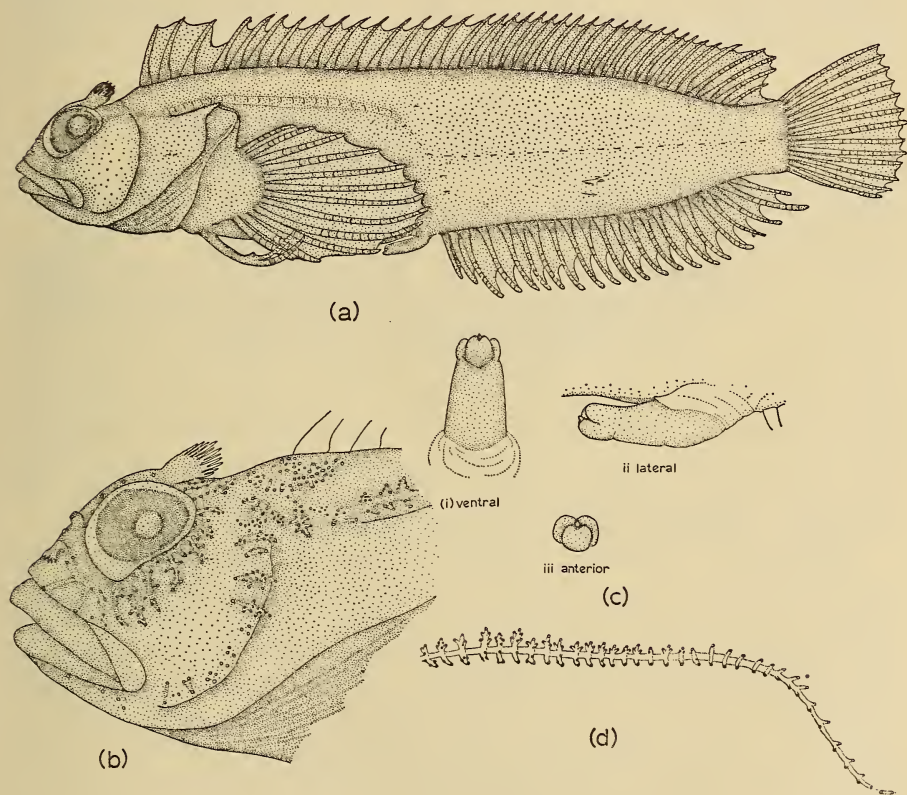


FIG. 24. *Clinus (Clinus) taurus*: (a) Lateral view, male, 116 mm, Dalebrook, 12/1/1966, S.A.M.; (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

Material examined. 17 specimens, 74–188.5 mm in standard length. 1 from Lambert's Bay, S.A.M. 24008; 1 from Kommetjie, Cape Peninsula, S.A.M. 10454 (paralectotype); 4 from Strandfontein, False Bay, S.A.M. 24234; 11 from False Bay, S.A.M. 10451 (lectotype), S.A.M. 10450, S.A.M. 10452, S.A.M. 10453 (paralectotypes), 2 specimens, Cape, Paris Museum Cat. No. A. 2077 (syntypes of *C. cottoides*).

Remarks. *Clinus taurus* resembles *Clinus cottoides*, *Clinus latipennis*, *Clinus helenae*, and *Clinus heterodon* in having a concave interorbital, and represents the greatest development of the bony supraorbital ridges. It attains a larger size than the other species with a concave interorbital, and differs from them in having notches in the membrane between the four or five anterior dorsal spines, deepest between the third and fourth spines. In these respects it resembles *Clinus robustus* more closely, although *Clinus robustus* has a crest. The head pore system and the anterior part of the lateral line have more numerous pores than any of the other species of the genus *Clinus*.

Distribution (fig. 19). The known range of this species is Lambert's Bay ($32^{\circ}04'S.$, $18^{\circ}20'E$) to Port Alfred ($33^{\circ}36'S.$, $26^{\circ}54'E$). It is rare, and occurs at the bottom of the intertidal zone and infratidally.

Clinus (Clinus) venustris Gilchrist & Thompson, 1908
(Fig. 25)

Clinus venustris Gilchrist & Thompson, 1908: 130. Barnard, 1927: 861. Smith, 1966: 73.
Ophthalmolophus venustris: Smith, 1945: 542. Smith, 1949: 355, fig. 990.

Description. D. XXXVII-XLI (XXXIX-XLI) 2-3; A. II 23-28 (24-27); P. 14; V. I 2; C. 13. Gill-rakers in outer series on first arch 3 + 6-8. Vertebrae 18 (rarely 17) + 28-31. First dorsal spine low, about equal to fourth; second, and to lesser extent third, dorsal spines elevated, second spine 0.5-3 mm higher than first or fourth spines. No notch in membrane between third and fourth dorsal spines, but second and third spines project above membrane. Clusters of 2-3 cirri at tips of dorsal spines for about half length of fin. Pectoral fin rounded. Third pelvic ray absent. Caudal peduncle short, length 26.5-33% head length, depth 23.5-29% head length. Caudal fin subtruncate.

Body slightly compressed, covered with small embedded scales not extending on to fin bases or head. Depth 4-5 in standard length. Head 3.75-4.75 in standard length, forehead sloping rather steeply to eyes. Snout bluntly rounded. Eye 2.25-3.75 in head, noticeably large. Supraorbital tentacle with short, flattish stalk and flattened tip ending in several short, simple branches. Cirrus on anterior nostril flattened and spoon-shaped, margin shallowly indented. Upper jaw 39-48% head length. Lips moderately thick. Vomer toothed. Sensory pores of head single in nasal and interorbital series, mainly single in mandibular, preopercular, and postorbital series, double in remaining series (fig. 25(b)).

Lateral line of vertical pairs of pores in front to post-pectoral curve, then of short separate horizontal tubes with pore at either end (fig. 25(d)). Intromittent organ of male with moderately long basal portion; confluent pair of dorsal lips and large pair of ventro-lateral lips, both with serrated inner margins, ensheathing slender tip (fig. 25(c)).

Colouring. Very variable. Specimens from the coast north of Lambert's Bay pale buff with brown streaks, speckles, and reticulations. Bright blue red-

edged spot over first three dorsal spines. Fins red-tipped, anal fin often entirely red. Branchiostegal membranes pale with fine black dots. Characteristic dark line along edge of united gill membranes. Four specimens taken at Sea Point were plain crimson. Uniform yellow preserved in alcohol.

Location of type material. South African Museum, Cape Town.

Lectotype. Male, 103 mm standard length, Fish Hoek, False Bay, S.A.M. 25238.

Material examined. 43 specimens, 40–106 mm in standard length. 13 from Lüderitzbucht, S.A.M. 24212; 2 from Port Nolloth, S.A.M. 24217; 1 from Hondeklip Bay, S.A.M. 25072; 1 from southern Namaqualand, S.A.M. 24017; 7 from Saldanha Bay, S.A.M. 18462; 4 from Sea Point, S.A.M. 23948 and 17/2/1965, S.A.M. not catalogued; 15 from Fish Hoek, False Bay, S.A.M.

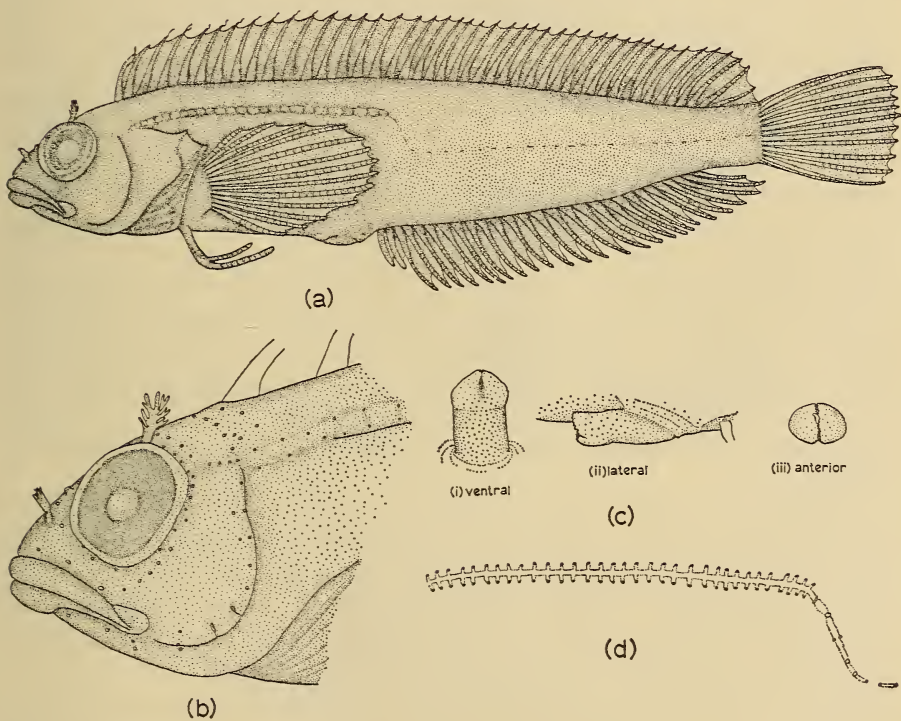


FIG. 25. *Clinus* (*Clinus*) *venustris*: (a) Lateral view, male, 91 mm, S.A.M. 25072; (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

25238 (lectotype), S.A.M. 10543 (paralectotypes).

Remarks. This species is not strikingly similar to any of the other species of *Clinus*, and appears to be almost as close to forms such as *Clinus superciliosus* and *Clinus woodi* as to forms such as *Clinus acuminatus* and *Clinus agilis*. The form of the dorsal fin is different from that of any of the other species.

Distribution (fig. 19). The known range is from Lüderitzbucht (26°28'S., 15°10'E) (South West Africa) to Port Alfred (33°36'S., 26°54'E). This rare species occurs infratidally and in pools at the bottom of the intertidal region. It is taken intertidally more frequently west of Cape Point than from False Bay eastwards.

Clinus (Clinus) woodi (Smith, 1945)
(Fig. 26)

Petraites woodi Smith, 1945: 540, fig. 2, 1949: 353, pl. 77 fig. 984.

Description. D. XXVII–XXXI 5; A. II 21–24; P. 12–13; V. I 2; C. 13. Vertebrae 15 + 27. First three dorsal spines elevated, forming high, triangular crest; third and fourth dorsal spines widely separated, membrane from third spine barely reaches base of fourth (table 3). First dorsal spine originates far forward, over hind margin of eye (table 6). Clusters of cirri at tips of at least first three dorsal spines. Pectoral fin rounded. Third pelvic ray absent. Caudal peduncle short, length 21.5–33.5% head length, depth 21.5–23.5% head length. Caudal fin subtruncate.

Body slightly compressed, covered with small, embedded, more or less overlapping scales extending on to dorsal and caudal fin bases but not anal fin base or head, apart from three scales at upper anterior edge of opercle. Depth 3.5–4 in standard length. Head 3.5–4 in standard length, snout rounded, rather more conical in smaller specimens. Eye 3–4 in head. Supraorbital tentacle with cylindrical stalk giving off fine filamentous branches towards tip. Cirrus on anterior nostril short, flattened, bilobed. Mouth large, upper jaw 50–53.5% head length. Lips moderately thick. Vomer toothed. Sensory pores of head very small, single in nasal, interorbital and supraorbital series, mainly single in mandibular series; mainly double, occasionally multiple in remaining series (fig. 26(b)).

Lateral line narrow in front, difficult to see in detail, of vertical pairs of pores or single pores opening above or below line to post-pectoral curve, then of short separate horizontal tubes with pore at each end (fig. 26(d)). Pores very minute. Intromittent organ of male with fairly long basal portion; tip ensheathed by small pair of round dorsal lips and large pair of ventro-lateral lips, almost confluent, with constriction in centre (fig. 26(c)).

Colouring. No fresh specimens seen. Smith (1945) described the colouring as 'vivid in marbled olive, brown, and red, with obscure irregular cross-bars. One or two red oblique bars across cheek.' Uniform yellow preserved in alcohol.

Location of type material. Department of Ichthyology, Rhodes University, Grahamstown.

Material examined: 6 specimens, 81–146 mm in standard length. 1 from Xora Mouth, S.A.M. 24241; 5 from Xora Mouth, R.U.C. (paratypes).

Remarks. *Clinus woodi* appears to be very close to *Clinus superciliosus*. The range of distribution of these two species does not overlap, but they are clearly speci-

fically distinct. The male *Clinus superciliosus* described by Gilchrist & Thompson (1908) as *Clinus ornatus* approaches *Clinus woodi* in the forward displacement of the dorsal origin and the form of the supraorbital tentacle. The intromittent organ of *Clinus woodi* approaches the type found in *Clinus agilis*, and also is rather similar to that of *Clinus superciliosus*, in which the tip is surrounded by an almost continuous fold of skin.

Distribution (fig. 19). The known range is Kei Mouth ($32^{\circ}41'S.$, $28^{\circ}23'E$) to Inhambane ($23^{\circ}51'S.$, $35^{\circ}29'E$) (Mozambique). The species is said to be fairly common (Mrs. M. M. Smith, personal communication).

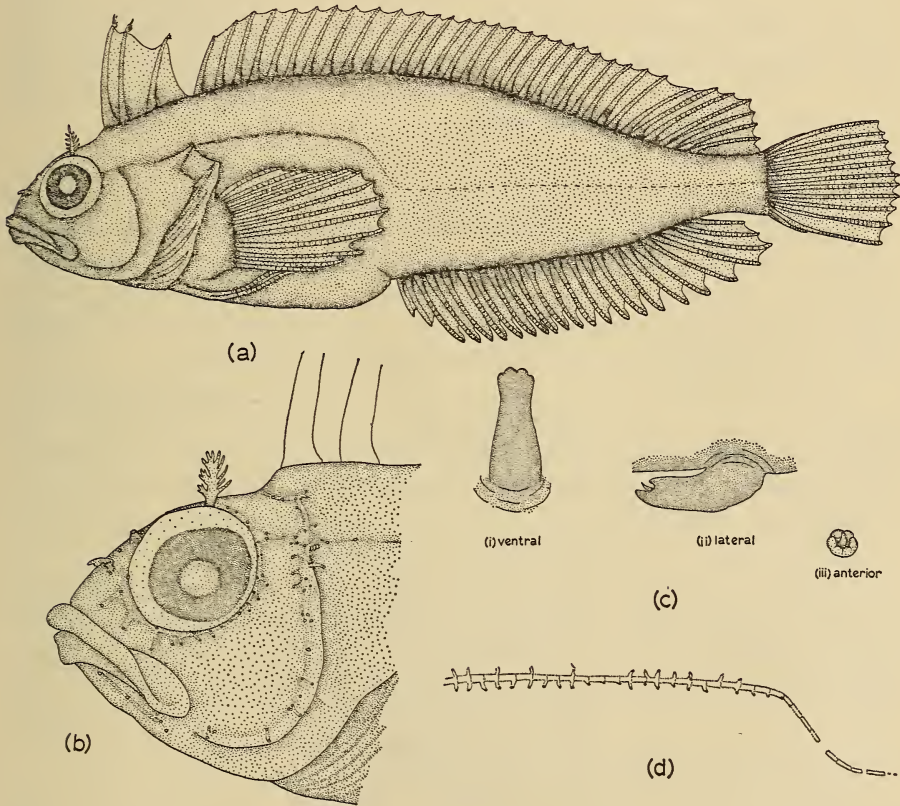


FIG. 26. *Clinus (Clinus) woodi*: (a) Lateral view, female, 112 mm, Xora Mouth, July 1962, R.U.C.; (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

Genus PAVOCLINUS Smith, 1945

Cristiceps non Valenciennes, Gilchrist & Thompson, 1908: 138 (type-species *Cristiceps australis* Valenciennes in Cuvier & Valenciennes, by monotypy).

Pavoclinus Smith, 1945: 545 (type-species *Clinus pavo* Gilchrist & Thompson, by original designation).

Labroclinus Smith, 1945: 544 (type-species *Cristiceps mentalis* Gilchrist & Thompson, by original designation).

Fucomimus Smith, 1945: 544 (type-species *Clinus mus* Gilchrist & Thompson, by monotypy).

Myxodes non Cuvier, Smith, 1945: 544 (type-species *Myxodes viridis* Valenciennes in Cuvier & Valenciennes, by monotypy).

Smithichthys Hubbs, 1952: 107 (type-species *Clinus fucorum* Gilchrist & Thompson, by monotypy).

Diagnosis. No tentacle over eye. Lateral line narrow in front, mainly of single pores opening medially or above and below line to post-pectoral curve, then of short separate horizontal tubes with pore at either end. Body covered with small cycloid scales, imbricating or not. Intromittent organ of male with short basal portion and very large conical tip surrounded at base by single pair of dorso-lateral lips. Body compressed, sometimes deep. Caudal peduncle usually elongate. Vomer toothed or not. Usually anterior crest of elevated first three dorsal spines, separated from rest of fin or not. Exclusively weed-dwelling species. Mouth fairly small, upper jaw averages less than 40% head length. No clusters of cirri at tips of dorsal spines.

Discussion

Smith (1945) arranged six species in four genera as follows:

1. *Pavoclinus*: forms with teeth on the vomer, and the first three dorsal spines elevated to form a crest, which is not separated from the rest of the fin by a notch in the membrane. Two species, *pavo* Gilchrist & Thompson and *graminis* Gilchrist & Thompson. Two additional species have subsequently been added to this group, *profundus* Smith, 1960 and *litorafontis* Penrith, 1965.
2. *Labroclinus*: forms with teeth on the vomer, and the first three dorsal spines elevated to form a crest, which is separated from the rest of the fin by a deep notch, the membrane from the third spine barely reaching the base of the fourth. Two species, *mentalis* Gilchrist & Thompson and *laurentii* Gilchrist & Thompson.
3. *Fucomimus*: forms lacking teeth on the vomer, with two bands of teeth in each jaw. One species, *mus* Gilchrist & Thompson.
4. *Myxodes*: forms lacking teeth on the vomer, with one row of teeth in the jaw. One species, *fucorum* Gilchrist & Thompson. Hubbs (1952) pointed out that, as *Myxodes* is a South American genus of oviparous Clinidae, lacking a fleshy penis in the male, and having external fertilization, *fucorum*, with a penis in the male and internal fertilization, cannot be a member of the genus *Myxodes*, and he proposed a new generic name, *Smithichthys*, for that species.

I believe that the features uniting the eight species mentioned above are too numerous and important to allow their separation into more than one genus, and they are therefore placed together in the genus *Pavoclinus*. I have used the name *Pavoclinus*, which contains all the most typical members of the genus, because this will necessitate the least number of alterations of name and additions to the synonymy. The names *Fucomimus* and *Labroclinus* have page preference over *Pavoclinus*. To use either *Fucomimus* or *Labroclinus* would result in extensive additions to the synonymy of the species. In the interest of maintaining the stability of the nomenclature, I therefore claim the privilege of the first reviser of the group to use *Pavoclinus* (*International Commission for Zoological*

Nomenclature, 1964, article 24(a), recommendation 24A).

The elongation of the caudal peduncle, compression of the body, and the coloration, including the frequently occurring translucent patches in the fin membranes, are presumably all modifications for a weed-dwelling existence. However, these similarities seem to be too many to be the result of convergence, and appear to indicate close relationship. *Clinus brevicristatus* and *Gynutoclinus rotundifrons* are also habitually weed-dwellers, but these two species do not share the features common to the *Pavoclinus* species. There is also considerable uniformity in the form of the intromittent organ of the *Pavoclinus* species. I believe that division of this group into more than one genus would obscure the relationships of the species.

Four subgenera are used to indicate the relationships of the species within the genus. Three of these are monospecific, and the fourth contains a closely related group of species.

The lack of vomerine teeth in the two species *mus* and *fuorum* appears to warrant their separation from the remaining species at a subgeneric level. Although it is possible that they are more closely related to one another than to any of the other species, *mus* and *fuorum* differ sufficiently from one another to justify the retention of *Smithichthys* and *Fucomimus* as separate subgenera. *Pavoclinus mus* differs from *P. fuorum* in having two rows of teeth in each jaw, the snout not upturned, the form and position of the dorsal fin origin, and in having 11 as opposed to 13 primary caudal rays (unique among the South African Clinidae).

The species *pavo*, *graminis*, and *laurentii* are so similar that even subgeneric distinction on account of the separation in *laurentii* of the dorsal crest seems unwarranted. However, the close association of *laurentii* with *mentalis* (Barnard, 1927; Smith, 1945), does not appear to be correct. *Pavoclinus graminis*, *P. pavo*, and *P. laurentii* all have fewer than 35 dorsal spines and fewer than 25 anal rays, while *P. mentalis* is markedly elongate, with a high number of dorsal and anal elements (35–39 dorsal spines and 29–30 anal rays). *P. mentalis* has a long skinny projection at the lower jaw symphysis, and reaches a very large size. On account of its peculiar features, and to emphasise the particularly close relationship between the species *pavo*, *graminis*, *laurentii*, *litorafontis*, and probably *profundus*, *mentalis* is placed in a separate subgenus *Labroclinus*.

Pavoclinus graminis and *P. laurentii* are the two least strongly modified species, having a fairly normal body shape rather like that of most species of the subgenus *Clinus* (*Clinus*). *Pavoclinus pavo* and *P. litorafontis* are somewhat more compressed, with rather longer caudal peduncles. It is proposed to include these four species in a subgenus *Pavoclinus*, together with, provisionally, *Pavoclinus profundus*, which is at present known only from the unique type.

The eight species of *Pavoclinus* are compared in table 7.

Distribution. West (26°38'S., 15°10'E) to east (23°51'S., 35°29'E) coasts of South Africa (fig. 27), mainly east of Cape Point, only one species, *Pavoclinus pavo*, occurring west of Cape Point. Mainly intertidal, in seaweed.

TABLE 7. Comparison of the species of *Favoclinus*.

Abbreviations: S.L. = standard length; H.L. = head length; U. jaw = upper jaw; d.s. = dorsal spine; C.P.L. = caudal peduncle length; C.P.D. = caudal peduncle depth; D.O. = dorsal fin origin; preperc. or preop. = preopercle.

Characters	<i>mus</i>	<i>mentalis</i>	<i>graminis</i>	<i>laurentii</i>	<i>litorafontis</i>	<i>pavo</i>	<i>profundus</i>	<i>fuorum</i>
Dorsal spines	25-28 (26-27)	35-39 (36-37)	30-35 (32-33)	29-33 (30-32)	29-32 (31-32)	30-36 (31-33)	30	28-31 (29-30)
Dorsal rays	3-4 (3)	6-8 (6-7)	4-6 (5)	4-5	7-8	2-4 (3)	4	4-6 (5-6)
Anal rays	14-18 (15-17)	27-32 (29-30)	21-24 (22-23)	20-22 (21-22)	20-23 (23)	20-25 (20-22)	21	19-21
Pectoral rays	10	11-12	12	12	11-12	11-12 (12)	12	12-13 (12)
Caudal rays	11	13	13	13	13	13	13	13
3rd pelvic ray	Moderate	Well-developed	Moderate	Moderate	Well-developed	Minute	Minute	Moderate
H.L. in S.L.	4-5	4-4.75	3.5-4.75	4.25-4.75	3.75-5	3.5-4.75	3.9	4-4.75
Body Depth	3.5-4.5	4.5-5.5	4-5	4-5.5	4.5-5.75	3.75-5	4.8	3.5-4.5
U. jaw (% H.L.)	27-33.5	35-40	30-36	36-41	33.5-41.5	22-36.5	36.4	32-42
Eye in H.L.	2.5-3.75	4.75-5.75	2.5-3.75	2.75-3.75	3.75-5	3-4	3	3-5
1st d.s. (% S.L.)	8-12.5	9-10.75	6.5-11	8-13	9-16.5	5.5-10.5	5.8	13.75-21.5
C.P.L. (% H.L.)	60-75	35-40	26.5-38.5	33-47	58.5-75	40-46.5	36.4	47-62.5
C.P.D. (% H.L.)	24-27.5	20-25	26-31	22-25	22.5-33.5	26.5-31	27.2	23.5-30
Vomerine teeth	Absent	Present	Present	Present	Present	Present	Present	Absent
Notch $\frac{1}{2}$ d.s.	Present, deep	Present, deep	Absent	Present, deep	Absent	Absent	Absent	Absent
Position of D.O.	Over preoperc.	Over preoperc.	Over preoperc.	Over preoperc.	Over preoperc.	Over preoperc.	Over preoperc.	Over hind margin of eye

Subgenus *Fucomimus* Smith, 1945

Fucomimus Smith, 1945: 544 (type-species *Clinus mus* Gilchrist & Thompson).

Diagnosis: Vomer edentate; two rows of teeth in each jaw. First three dorsal spines elevated to form crest. Membrane from third spine barely reaches base of fourth. Snout not puglike. Body highly compressed. Scales minute, embedded, non-imbricating. Lateral line scales not distinct. Caudal peduncle long. Caudal rays 11.

One species, *Pavoclinus (Fucomimus) mus* (Gilchrist & Thompson).

Pavoclinus (Fucomimus) mus (Gilchrist & Thompson, 1908)
(Fig. 28)

Clinus mus Gilchrist & Thompson, 1908: 119. Barnard, 1927: 864.

Fucomimus mus: Smith, 1945: 544, 1949: 356, pl. 79 fig. 997 and fig. 997.

Description. D. XXV-XXVIII (XXVI-XXVII) 3-4 (3); A. II 14-18 (15-17); P. 10; V. I 3; C. 11. Gill-rakers in outer series on first arch 3-4 + 5-7. Vertebrae 14 + 27-28. First three dorsal spines elevated to form low crest, well separated from rest of fin by wide gap between third and fourth dorsal spines; membrane from third dorsal spine barely reaches base of fourth. Pectoral fin rather narrow, upper edge straight. Inner pelvic ray always present, about half length and diameter of other two rays. Dorsal fin with translucent membranes between groups of 2-4 spines. Caudal peduncle long, length 60-75% head length, depth 24-27.5% head length. Caudal fin subtruncate.

Body highly compressed, covered with minute, embedded, isolated scales not extending on to dorsal, caudal, or anal fin bases, or head. Depth 3.5-4.5 in standard length, deepening with increase in standard length. Head 3.75-5 in standard length, snout rounded. Eye 2.5-4 in head. No supraorbital tentacle. Cirrus on anterior nostril slightly elongate, curved forward over nostril. Upper jaw 27-33.5% head length, mouth small. Lips moderately thick. Vomer edentate. Sensory pores of head mostly single in all series (fig. 28(b)).

Lateral line narrow in front, of single, more or less medially opening pores to post-pectoral curve, then of short separate horizontal tubes with pore at either end (fig. 28(c)). Intromittent organ of male with short thick basal portion, long, fairly slender conical tip, and pair of lobed dorso-lateral lips (fig. 28(b)).

Colouring. Very variable. Ground colour various shades of green or brown, mottled and streaked in intricate patterns with yellow, mauve, olive, black, white, dark green, dark brown, and silver. Dorsal and caudal fins with translucent patches. Other fins green or brown. Belly not lighter than general ground colour. Juveniles uniform dark brown. Uniform yellow preserved in alcohol.

Location of type material. South African Museum, Cape Town.

Lectotype. Male, 75 mm standard length, St. James, Kalk Bay, no other data, S.A.M. 25233.

Material examined. 310 specimens, 22–86 mm in standard length. 2 from Froggy Pond, False Bay, S.A.M. 23893; 1 from Glencairn, False Bay, S.A.M. 23883; 2 from Kalk Bay, False Bay, S.A.M. 17936, S.A.M. 18075; 82 from Dalebrook, False Bay, S.A.M. 23880, S.A.M. 23895, S.A.M. 23897, and 18/12/1964, 19/2/1965 and 18/4/1965, S.A.M. not catalogued; 9 from St. James, Kalk Bay, False Bay, S.A.M. 25233 (lectotype), S.A.M. 10531 (paralectotypes); 11 from St. James, False Bay, S.A.M. 12021, and 16/5/1965, S.A.M. not catalogued; 173 from Strandfontein, False Bay, S.A.M. 23879, S.A.M. 23884, S.A.M. 23961, S.A.M. 23973, S.A.M. 24246, and 19/2/1965 S.A.M. not catalogued; 4 from Strandfontein and Dalebrook, False Bay, S.A.M. 23882; 1 from Cape Peninsula, S.A.M. 23890; 1 from Gordon's Bay, False Bay, S.A.M. 23292; 9 from Onrust River Mouth, S.A.M. 24247; 6 from Still Bay, S.A.M. 25073; 1 from Kidd's Beach, East London, S.A.M. 25074; 1 from Igoda Mouth, East London, S.A.M. 25075; 4 from Gonubie Mouth, East London, S.A.M. 25076; 3 from Kei Mouth, S.A.M. 25077.

Remarks. *Pavoclinus mus* is a highly modified weed-dwelling species. The deep, strongly compressed body and the elongate caudal peduncle are like those of *Pavoclinus fucorum*. I consider the difference in dentition important enough in conjunction with other features to separate *mus* and *fucorum* at the subgeneric

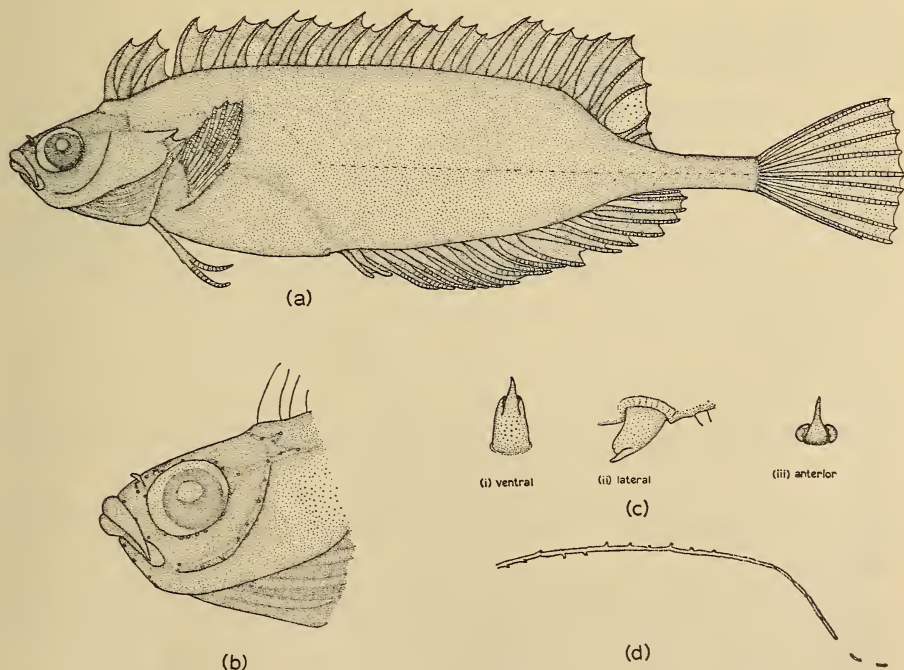


FIG. 28. *Pavoclinus (Fucomimus) mus*: (a) Lateral view, female, 61 mm, Strandfontein, 19/2/1965, S.A.M.; (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

level, especially since *Pavoclinus mus* has on the whole as many or more features in common with the species placed in the subgenus *Pavoclinus* than with *Pavoclinus fucorum*. *Pavoclinus mus* is rather similar to *Pavoclinus pavo* in having an extremely small mouth, a similar, although more exaggerated, body shape, and a rather delicate build compared with the other species.

Distribution (fig. 27). The known range is False Bay ($\pm 34^{\circ}10'S$, $18^{\circ}50'E$) to the Kei River ($32^{\circ}41'S$, $28^{\circ}23'E$). Quite abundant in dense growths of seaweed, particularly in the green alga *Caulerpa filiformis*, intertidal.

Subgenus *Labroclinus* Smith, 1945

Labroclinus Smith, 1945: 544 (type-species *Cristiceps mentalis* Gilchrist & Thompson).

Diagnosis: Vomer toothed; two rows of teeth in each jaw. First three dorsal spines form high crest. Membrane from third dorsal spine barely reaches base of fourth. Anal rays more than 25. Scales overlapping on anterior half of body. Caudal rays 13. Prominent skinny flap on lower jaw symphysis.

One species *Pavoclinus* (*Labroclinus*) *mentalis* (Gilchrist & Thompson).

Pavoclinus (*Labroclinus*) *mentalis* (Gilchrist & Thompson, 1908) (Fig. 29)

Cristiceps mentalis Gilchrist & Thompson, 1908: 139.

Petraites mentalis: Barnard, 1927: 866.

Labroclinus mentalis: Smith, 1945: 544, 1949: 357, pl. 81 fig. 998.

Description. D. XXXV-XXXIX (XXXVI-XXXVII) 6-8 (6-7) A. II 27-32 (29-30); P. 11-12; V. I 3; C. 13. Vertebrae 16 + 37. First three dorsal spines elevated to form crest, separated from rest of fin by wide gap between third and fourth dorsal spines. Membrane from third dorsal spine barely reaches base of fourth. Pectoral fin with upper edge more or less straight. Inner pelvic ray stout, equal to others. Caudal peduncle fairly long, length 35-40% head length, depth 20-25% head length. Caudal fin subtruncate.

Body highly compressed, covered with small embedded scales extending on to dorsal and caudal fin bases but not anal base or head, more or less overlapping on front half of body. Depth 4.5-5.5 in standard length. Head 4-4.75 in standard length, snout narrowly pointed. Eye 4.25-5.75 in head. No supra-orbital tentacle. Cirrus on anterior nostril small, flaplike over nostril. Upper jaw 35-40% head length. Lips thick. Prominent flap of skin on lower jaw at symphysis. Vomer toothed. Sensory pores of head mostly single, occipital series double (fig. 29(b)).

Lateral line of mainly single pores opening above or below line or medially in front to post-pectoral curve, then of short separate horizontal tubes with pore at either end (fig. 29(d)). Intromittent organ of male with short basal portion and large conical tip with pair of crescentic dorso-lateral lips ensheathing it at base (fig. 29(c)).

Colouring. No fresh specimens seen. According to Smith (1949), 'most vivid and brilliant colouring, rather varied, aptly named 'Rainbow-fish'. The young with brilliant silvery iridescent spots along body'. Uniform yellowish preserved in alcohol.

Location of type material. South African Museum, Cape Town.

Material examined. 8 specimens, 131–224 mm in standard length. 1 from East London, S.A.M. 9889 (holotype); 4 from East London, R.U.C.; 2 from Bizana Coast, R.U.C.; 1 from Xora Mouth, R.U.C.

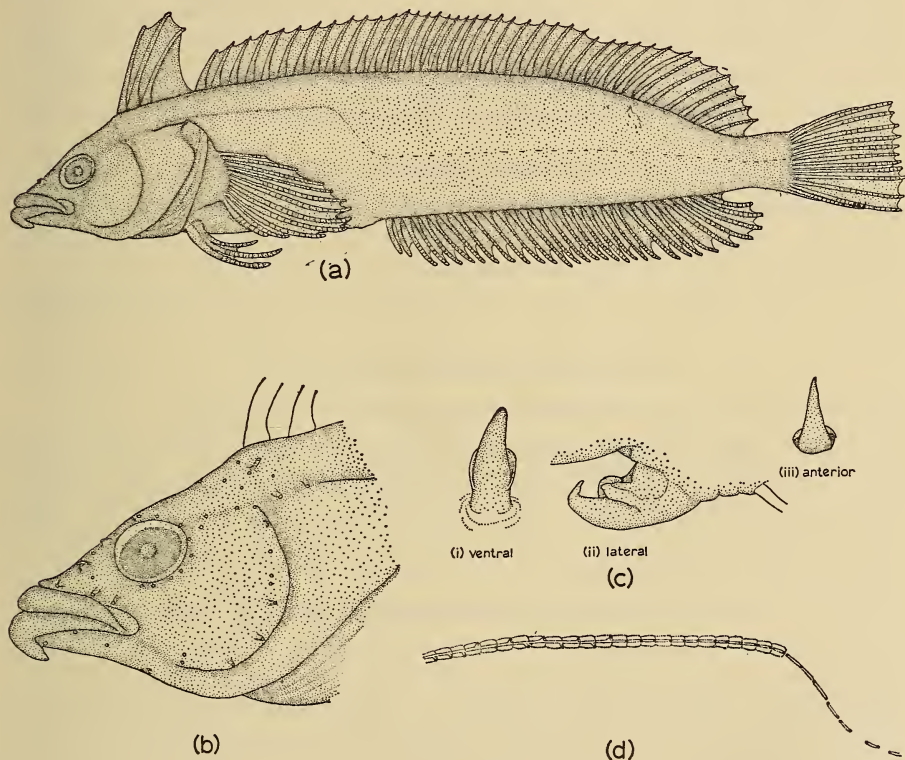


FIG. 29. *Pavoclinus (Labroclinus) mentalis*: (a) Lateral view, female, 165 mm, East London, R.U.C.; (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

Remarks. *Pavoclinus mentalis* was placed by Gilchrist & Thompson (1908) in the genus *Cristiceps* Valenciennes on account of its fully separated dorsal crest, although the same authors placed all the other South African Clinidae then described in the genus *Clinus*. The genus *Cristiceps* is Australasian and the species included in it are characterised by a high, sickle-shaped separate dorsal crest originating well forward over the eye, an elongate, very slender caudal peduncle, and a long, simple tentacle over the eye. *Pavoclinus mentalis* has no supraorbital tentacle, the crest originates in the usual position over the hind

margin of the preopercle, and the caudal peduncle, although somewhat elongate, is not very slender. The species therefore can not be included in the genus *Cristiceps*.

Barnard (1927) commented on the similarity between *mentalis* and *laurentii* and placed them in the genus *Petraites*, also Australian. *Petraites* has a fringed supraorbital tentacle and is probably not distinct from *Clinus*, so that the inclusion of *mentalis* and *laurentii* in *Petraites* was unsuitable. In 1945 Smith erected the genus *Labroclinus* for *mentalis* and *laurentii*. The association of *mentalis* and *laurentii* by these authors appears to have been based entirely on the separation of the dorsal crest, and may also have been influenced by the very similar distribution of the two species. As has been pointed out, neither of these species should be separated from the species of the genus *Pavoclinus*, but *mentalis* is considered to differ sufficiently from *laurentii* and the other species to warrant subgeneric separation.

When Smith (1945) designated *mentalis* as type-species of *Labroclinus* he cited it as '*Clinus*' *mentalis* Gilchrist & Thompson, but this is incorrect, as the name *Clinus* had never been used for *mentalis*.

Distribution (fig. 27). The known range is Port Alfred (33°36'S., 26°54'E) to St. Lucia Bay (28°23'S., 32°25'E). The species is rare, and occurs infratidally as well.

Subgenus *Pavoclinus* Smith, 1945

Pavoclinus Smith, 1945: 545 (type-species *Clinus pavo* Gilchrist & Thompson).

Diagnosis. Vomer toothed; two rows of teeth in each jaw. First three dorsal spines forming crest or not. With or without notch in membrane between third and fourth dorsal spines. Scales usually overlapping on at least front half of body. Body compressed. Caudal rays 13. No skinny flap on lower jaw symphysis. Anal rays less than 25.

Five species. *Pavoclinus graminis* is the most generalized species, having the shortest caudal peduncle and the least compression of the body. *Pavoclinus laurentii* has a rather longer caudal peduncle but is also not greatly compressed. *Pavoclinus pavo* and *Pavoclinus litorafontis* are highly compressed forms with an elongate caudal peduncle. *Pavoclinus profundus* is a peculiar infratidal species known only from the holotype; it resembles the other species of this subgenus more closely than it does any of the other clinids, but the dorsal fin is without any crest and the caudal peduncle is quite short.

Pavoclinus (Pavoclinus) graminis (Gilchrist & Thompson, 1908)

(Fig. 30)

Clinus graminis Gilchrist & Thompson, 1908: 136.

Clinus heterodon non Valenciennes in Cuvier & Valenciennes, Barnard, 1927: 863. Smith, 1935: 217.

Pavoclinus heterodon: Smith, 1945: 545, 1949: 357, pl. 80 figs 1001.

Description. D. XXX-XXXV (XXXII-XXXIII) 4-6 (5); A. II 21-24 (22-23); P. 12; V. I 3; C. 13. Gill-rakers in outer series on first arch 2-3 + 4-5. Verte-

brae 15 + 29-31. First three dorsal spines elevated to form crest, fairly low, second spine highest. No notch in membrane between third and fourth dorsal spines. Pectoral fin with upper edge more or less straight. Inner pelvic ray slender, about half length and diameter of others. Caudal peduncle moderate, 26.5-38.5% head length, depth 26-31% head length. Caudal fin subtruncate.

Body moderately compressed, covered with small embedded scales extending on to dorsal and caudal fin bases but not anal fin base or head, overlapping over whole body surface. Depth 4-5 in standard length. Head 3.5-4.75 in standard length, snout rounded to bluntly conical. Eye 2.5-3.75 in head. No supraorbital tentacle. Cirrus on anterior nostril very small, flaplike, covering nostril. Upper jaw 30-36% head length, mouth small. Lips moderately thick. Vomer toothed. Sensory pores of head mainly single in nasal, interorbital, mandibular and preopercular series, double or multiple in other series (fig. 30(b)).

Lateral line of single pores opening above or below line in front to post-pectoral curve, then of short separate horizontal tubes with pore at either end (fig. 30(d)). Intromittent organ of male with short basal portion and large conical tip emerging between pair of curved more or less confluent dorso-lateral lips (fig. 30(c)).

Colouring. Very variable, green, brown, red, often mottled, streaked or with cross-bars of yellow, silver, or deeper shades of the ground colour; pearly spots on body in young specimens, which are usually otherwise plain red. Fins plain or barred, with small translucent areas particularly on dorsal and caudal fins. Belly usually not lighter than ground colour. Colours tend to be brighter and more variable further east along the coast. Uniform yellow preserved in alcohol.

Location of type material. South African Museum, Cape Town.

Lectotype. Female, 126 mm, St. James, donated by Mr. Langschmidt, S.A.M. 25240.

Material examined. 100 specimens 24-141 mm in standard length. 1 from Miller's Point, False Bay, S.A.M. 23899; 8 from Dalebrook, False Bay, S.A.M. 23896, S.A.M. 23900 and 18/12/1964 and 18/4/1965 S.A.M. not catalogued; 12 from St. James, S.A.M. 25240 (lectotype), S.A.M. 10523 (paralectotypes) and 16/5/1965, S.A.M. not catalogued; 12 from Strandfontein, False Bay, S.A.M. 23885, S.A.M. 23901, S.A.M. 24249; 4 from Still Bay, S.A.M. 25078, 4 from Kidd's Beach, East London, S.A.M. 25079; 4 from Igoda Mouth, East London, S.A.M. 25080; 22 from East London, S.A.M. 23903, S.A.M. 25081; 4 from Gonubie Mouth, S.A.M. 25083; 17 from Port St. John's, S.A.M. 23902.

Remarks. *Clinus heterodon* was described from the Cape by Valenciennes (1836), and listed by Gilchrist & Thompson (1908), who stated that they had not rediscovered the species here. Barnard (1927) identified the specimens from which they described *graminis* as *C. heterodon* of Valenciennes. However, the original description of *C. heterodon* was so inadequate that one could not base

an identification on it without examining the holotype. I found that the holotype is a tentacled clinid of the genus *Clinus*. Gilchrist & Thompson's name *graminis* therefore stands for the species of the genus *Pavoclinus* described above. *Distribution* (fig. 27). The known range is False Bay ($\pm 34^{\circ}06'S.$, $18^{\circ}50'E$) to Inhambane ($23^{\circ}51'S.$, $35^{\circ}29'E$) (Mozambique), becoming more common eastwards. Usually intertidal, in weed. Smith (1945 and 1949) gave Port Nolloth as the north-western limit of this species, but its occurrence anywhere west of Cape Point has not been confirmed, and it seems certain that the record was an error.

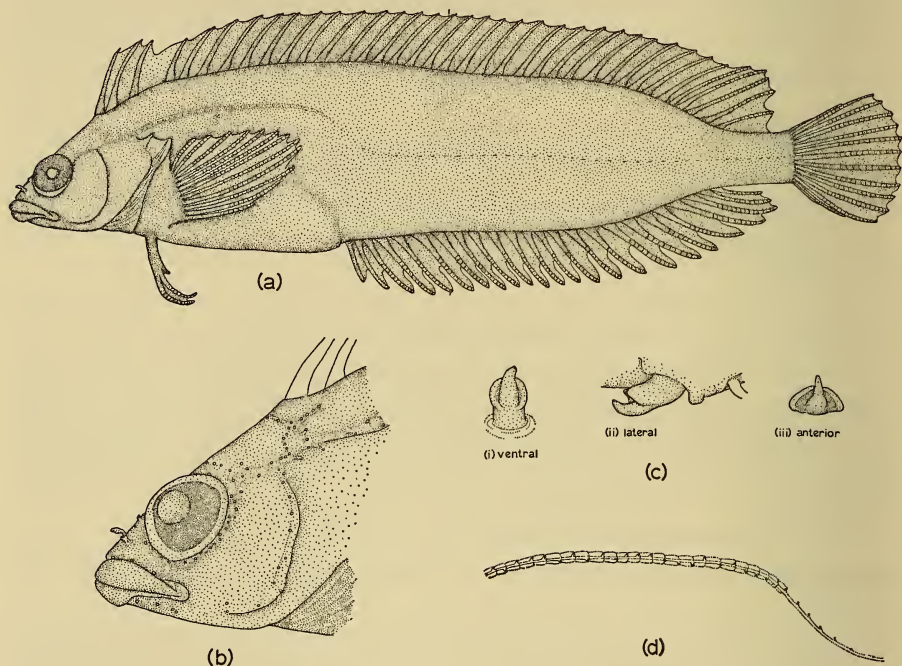


FIG. 30. *Pavoclinus* (*Pavoclinus*) *graminis*: (a) Lateral view, female, 115 mm, S.A.M. 25083 (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

Pavoclinus (*Pavoclinus*) *laurentii* (Gilchrist & Thompson, 1908)
(Fig. 31)

Clinus laurentii Gilchrist & Thompson, 1908: 120. Smith, 1935: 218, fig. 5.

Petraites laurentii: Barnard, 1927: 866.

Labroclinus laurentii: Smith, 1945: 544, 1949: 357, pl. 80 fig. 999 and fig. 999.

Description. D. XXIX–XXXIII (XXX–XXXII) 4–5; A. II 20–22 (21–22); P. 12; V. I 3; C. 13. Gill-rakers in outer series on first arch 2–3 + 4–6. Vertebrae 15 + 27–29. First three dorsal spines elevated to form crest. Membrane from third to fourth dorsal spine barely reaches base of fourth. Crest moderate,

second spine highest. Pectoral fin somewhat rounded, but upper edge fairly straight. Inner pelvic ray about half length of other two, very slender. Caudal peduncle moderate, length 33–47% head length, depth 22–33% head length. Caudal fin subtruncate.

Body moderately compressed, covered with small embedded scales extending on to dorsal and caudal fin bases but not anal fin base or head, overlapping on front half of body. Depth 4–5.5 in standard length. Head 4.25–4.75 in standard length, snout rounded to bluntly conical. Eye 2.75–3.75 in head. No supraorbital tentacle. Cirrus on anterior nostril small, flaplike. Upper jaw 36–41% head length. Lips moderately thick. Vomer toothed. Sensory pores of head mostly double, many multiple pores in occipital region (fig. 31(b)).

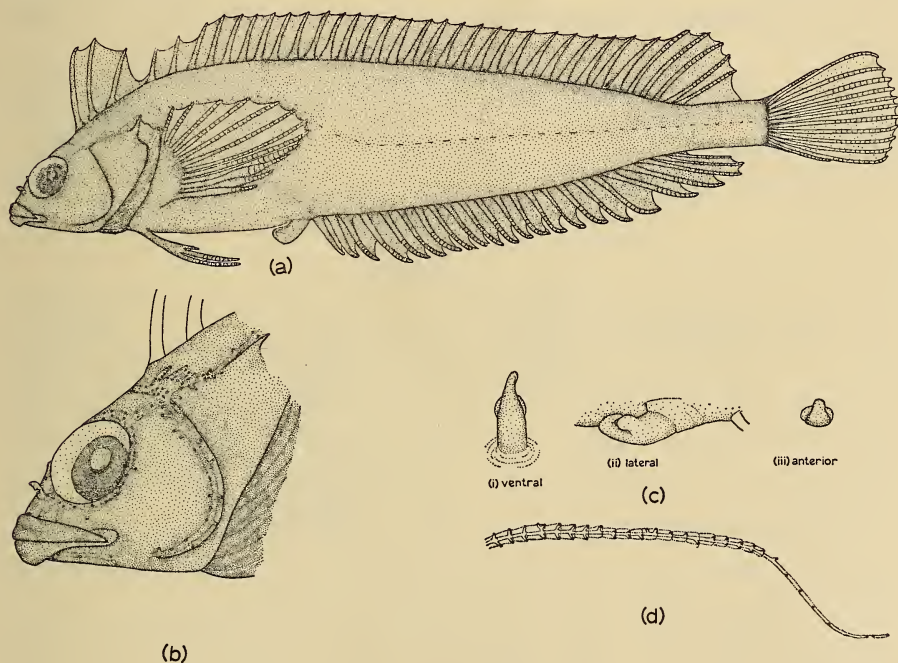


FIG. 31. *Pavoclinus (Pavoclinus) laurentii*: (a) Lateral view, male, 110 mm, Xora, May 1948, R.U.C.; (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

Lateral line of vertical pairs of pores or single pores opening above or below line in front to post-pectoral curve, then of short separate horizontal tubes with pore at either end (fig. 31(d)). Intromittent organ of male with short basal portion and large, conical tip, ensheathed at base by pair of confluent dorso-lateral lips (fig. 31(c)).

Colouring. No fresh specimens seen. Smith (1949) described the colouring as 'most variable, but beautiful and delicate colours and markings, brown, red, yellow, green, mottled and marbled.' Uniform buff to yellow preserved in alcohol.

Location of type material. South African Museum, Cape Town.

Lectotype. Female, 108 mm standard length, Winkelspruit, Natal, collected by L. Robinson, donated by R. Robinson, S.A.M. 25234.

Material examined. 15 specimens, 66–117 mm in standard length, 3 from Xora Mouth, R.U.C.; 1 from Bizana Coast, R.U.C.; 1 from Port St. John's, R.U.C.; 1 from Isipingo, R.U.C.; 3 from Winkelspruit, Natal, S.A.M. 25234 (lectotype), S.A.M. 9888 (paralectotypes); 4 from Natal, S.A.M. 10927, S.A.M. 16157, S.A.M. 18515; 1 from Inhaca Island, Mozambique, R.U.C., 1 from Inhambane, Mozambique, R.U.C.

Remarks. *Pavoclinus laurentii* is similar to *Pavoclinus mentalis* in the separation of the dorsal crest and in its distribution, but resembles *Pavoclinus graminis* in body shape, head shape, fin counts, and relative size of eye, and appears to be closer to the more generalized species than to *Pavoclinus mentalis*.

Distribution (fig. 27). Port Alfred (33°36'S., 26°54'E) to Inhambane (23°51'S., 35°29'E) is the known range. The species is said to be not uncommon (Smith, 1949) in weedy pools.

Pavoclinus (Pavoclinus) litorafontis Penrith, 1965
(Fig. 32)

Pavoclinus litorafontis Penrith, 1965a: 212, pl. 5, and figs 1 and 2.

Description. D. XXIX–XXXII (XXXI–XXXII) 7–8; A. II 20–23 (23); P. 11–12; V. I 3; C. 13. Gill-rakers in outer series on first arch 3–4 + 5–6. Vertebrae 17 + 32–33. First three dorsal spines elevated to form crest, decreasing in relative height with increase in size of fish. No notch in membrane between third and fourth dorsal spines. Upper edge of pectoral fin more or less straight. Inner pelvic ray stout, equal to others. Caudal peduncle long, length 58.5–75% head length, depth 22.5–33.5% head length. Caudal fin subtruncate.

Body compressed, covered with small embedded scales extending on to dorsal and caudal fin bases but not anal fin base or head, overlapping over most of body surface. Depth 4.5–5.75 in standard length. Head 3.75–5 in standard length, snout subconical. Eye 3.5–4.25 in head. No supraorbital tentacle. Cirrus on anterior nostril very small. Upper jaw 33.5–41% head length. Lips moderately thick. Vomer toothed. Sensory pores of head mostly single (fig. 32(b)).

Lateral line of single pores in front to post-pectoral curve, then of short separate horizontal tubes with pore at either end (fig. 32(d)). Intromittent organ of male with short basal portion and large, conical tip; single pair of crescentic dorso-lateral lips ensheathing base of tip (fig. 32(c)).

Colouring. Green, striped in shades of darker green, yellow, and silver longitudinally. Usually a yellow or silver stripe across cheek. Fins green, usually with translucent patches; always translucent patches in the caudal fin. Belly no lighter than ground colour, underparts green. Juveniles green or brown with a broad silver longitudinal stripe mid-laterally. Uniform yellow preserved in alcohol.

Location of type material. South African Museum, Cape Town.

Material examined. 22 specimens, 27–190 mm in standard length. 14 from Strandfontein, False Bay, S.A.M. 23876, S.A.M. 23877, S.A.M. 23952, S.A.M. 23962, S.A.M. 23972, S.A.M. 24052 (holotype), S.A.M. 24248, and March, 1965, S.A.M. not catalogued; 8 from Onrust River Mouth, S.A.M. 24081, S.A.M. 24257.

Remarks. *Pavoclinus litorafontis* appears to be the most strongly modified member of the subgenus *Pavoclinus*, and has the most elongate caudal peduncle in that subgenus. It is closest to *Pavoclinus graminis* in the form of the dorsal fin and the

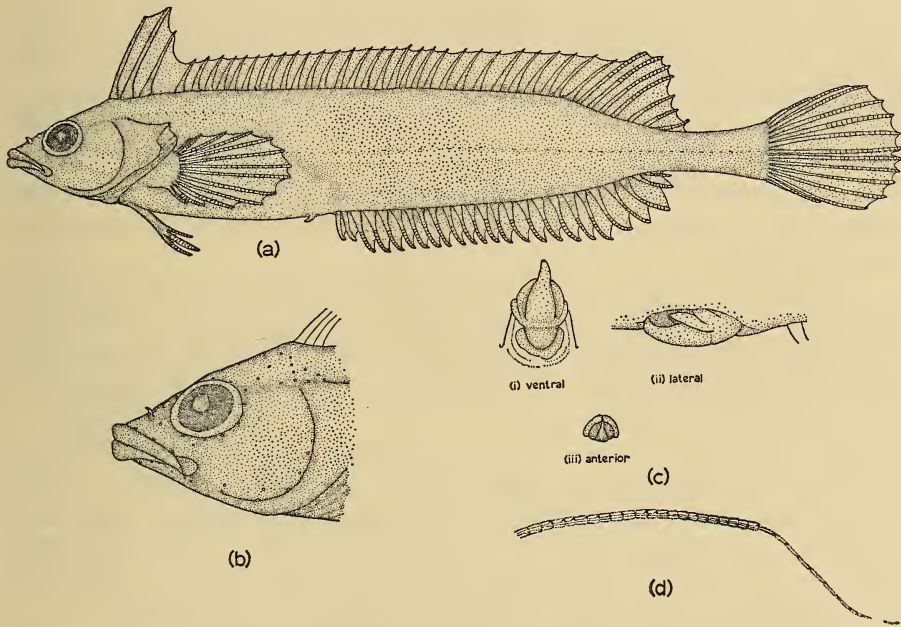


FIG. 32. *Pavoclinus (Pavoclinus) litorafontis*: (a) Lateral view, male, 89 mm, S.A.M. 23876; (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

head. It resembles *Pavoclinus mentalis* in the body proportions but not the fin counts other than the number of soft dorsal rays and the strong development of the inner pelvic ray. It attains a larger size than the other species of the subgenus *Pavoclinus*. Juveniles have a very poorly developed intromittent organ and it is usually impossible to sex small specimens externally.

Distribution (fig. 27). The known range is False Bay ($\pm 34^{\circ}10'S.$, $18^{\circ}50'E$) to Cape Agulhas ($34^{\circ}50'S.$, $20^{\circ}00'E$); not common, in sea-weed low down on the shore, particularly in beds of the green alga *Caulerpa filiformis*.

Pavoclinus (Pavoclinus) pavo (Gilchrist & Thompson, 1908)

(Fig. 33)

Clinus pavo Gilchrist & Thompson, 1908: 123. Barnard, 1927: 857.*Pavoclinus pavo*: Smith, 1945: 545, 1949: 357, pl. 81 figs 1000.

Description. D. XXX-XXXVI (XXXI-XXXIII) 2-4 (3); A. II 20-23 (20-22); P. 11-12 (12); V. I 2-3; C. 13. Gill-rakers in outer series on first arch 2-4 + 4-6. Vertebrae 15 + 28-31. First three dorsal spines elevated to form crest, second spine longest. No notch in membrane between third and fourth dorsal spines. Pectoral fin with upper edge more or less straight. Inner pelvic ray minute or absent. Caudal peduncle long, 40-47% head length, depth 20-30% head length. Caudal fin subtruncate.

Body compressed, covered with small embedded scales extending on to base of dorsal fin but not caudal and anal fin bases or head, overlapping on at least front half of body. Depth 3.75-5 in standard length, body deepening with increase in standard length. Head 3.5-4.75 in standard length, snout narrow, acutely pointed. Eye 3-4 in head. No supraorbital tentacle. Cirrus on anterior nostril flattened, flaplike, curving forward over nostril. Upper jaw 22-36.5% head length, mouth small. Lips thick. Vomer toothed. Sensory pores of head mostly single, occipital series and a few of preopercular and suborbital series double (fig. 33(b)).

Lateral line of single pores opening above and below line in front to post-pectoral curve, then of short separate horizontal tubes with pore at either end (fig. 33(d)). Intromittent organ of male with moderate basal portion and large, conical tip, swollen at base, and surrounded basally by large fleshy pair of ovoid dorso-lateral lips (fig. 33(c)).

Colouring. Variable, green, brown or red, sometimes mottled and striped longitudinally with yellow, lighter shades of the main colour and silvery white. Belly of same shade as ground colour. Often pearly spots on body. Dorsal and caudal fin with translucent patches. A specimen taken from kelp at Hondeklip Bay was olive yellow, with three turquoise blue ocellate spots on side and a turquoise blue line across cheek. Uniform yellow preserved in alcohol.

Location of type material. South African Museum, Cape Town.

Lectotype. Male, 88 mm standard length, St. James/Kalk Bay area, intertidal pools, no other data, S.A.M. 25236.

Material examined. 59 specimens, 15-111 mm in standard length. 1 from Shearwater Bay, Lüderitzbucht, S.A.M. 24213; 2 from Port Nolloth, S.A.M. 24218; 3 from Hondeklip Bay, S.A.M. 25084; 3 from Lambert's Bay, S.A.M. 23250; 1 from Langebaan, S.A.M. 21476; 1 from Melkbosch, 20/10/1964, S.A.M. not catalogued; 1 from Table Bay, S.A.M. 4728; 1 from Miller's Point, False Bay, S.A.M. 23894; 1 from Glencairn, False Bay, S.A.M. 23891; 1 from Kalk Bay, False Bay, S.A.M. 17935; 9 from Dalebrook, False Bay, S.A.M. 23888, S.A.M. 23898, and 18/4/1965, S.A.M. not catalogued; 2 from St. James/Kalk Bay, False Bay, S.A.M. 25236 (lectotype), S.A.M. 10532 (paralectotype); 4 from

St. James, 16/5/1965, S.A.M. not catalogued; 3 from Onrust River Mouth, S.A.M. 24251; 15 from Kidd's Beach, East London, S.A.M. 25085; 4 from Igoda Mouth, East London, S.A.M. 25086; 1 from East London, S.A.M. 23892; 6 from Kei Mouth, S.A.M. 25087.

Remarks. *Pavoclinus pavo* is apparently the only species of the genus *Pavoclinus* occurring on the coast west of Cape Point, although it is much more common east of Cape Agulhas. It is smaller and more delicately built than most of the other species which occur intertidally.

Distribution (fig. 27). The known range is Lüderitzbucht ($26^{\circ}38'S.$, $15^{\circ}10'E$) (South West Africa) to the Kei River ($32^{\circ}41'S.$, $28^{\circ}23'E$). It is nowhere very

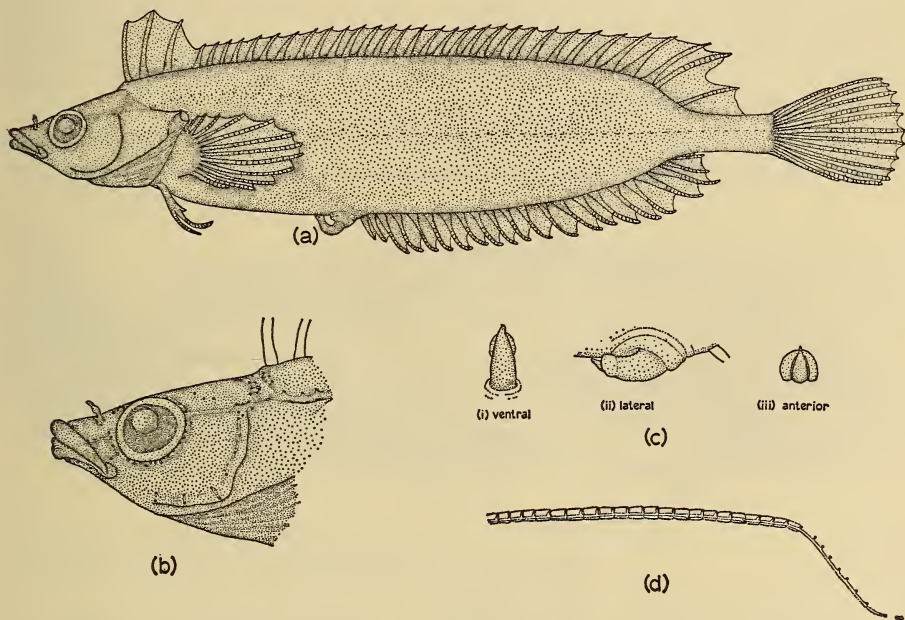


FIG. 33. *Pavoclinus (Pavoclinus) pavo*: (a) Lateral view, male, 60 mm, S.A.M. 23888; (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

common, but is not uncommon towards the eastern limit of its range. It lives intertidally in sea-weed. All the west coast specimens were taken in kelp, but in False Bay and localities eastward most of the specimens were found curled round the bases of short bushy growths of algae such as *Hypnea spicifera*; also in *Caulerpa* beds.

Pavoclinus (Pavoclinus) profundus Smith, 1960
(Fig. 34)

Pavoclinus profundus Smith, 1960: 689, fig. 1.

Description. D. XXX 4; A. II 21; P. 12; V. I 3; C. 13. Vertebrae 14 + 27. First three dorsal spines not elevated to form crest, but fourth spine slightly

shorter than third or fifth. No notch in membrane between third and fourth dorsal spines. Upper edge of pectoral almost straight. Inner pelvic ray minute, bound to outer rays by membrane, tip not free. Caudal peduncle moderate, length 36.4% head length, depth 27.2% head length. Caudal fin subtruncate.

Body highly compressed, sparsely covered with small embedded scales, not overlapping. Head naked. Depth at anal origin 4.8 in standard length. Head 3.9 in standard length, snout acutely pointed. Eye 3 in head. No supraorbital tentacle. Cirrus on anterior nostril a small flap. Upper jaw 36.4% head length, mouth small. Lips moderately thin. Vomer toothed. Sensory pores of head mostly single (fig. 34(b)).

Lateral line of single pores opening above or below line or medially in front to post-pectoral curve, then of short separate horizontal tubes with pore at either end, becoming obscure on caudal peduncle (fig. 34(d)). Intromittent organ of male with short basal portion and large conical tip; pair of elongate fleshy dorso-lateral lips partially ensheathing tip (fig. 34(c)).

Colouring. Only the preserved type seen. Detailed description of fresh colouring given by Smith (1960). Uniform buff preserved in alcohol.

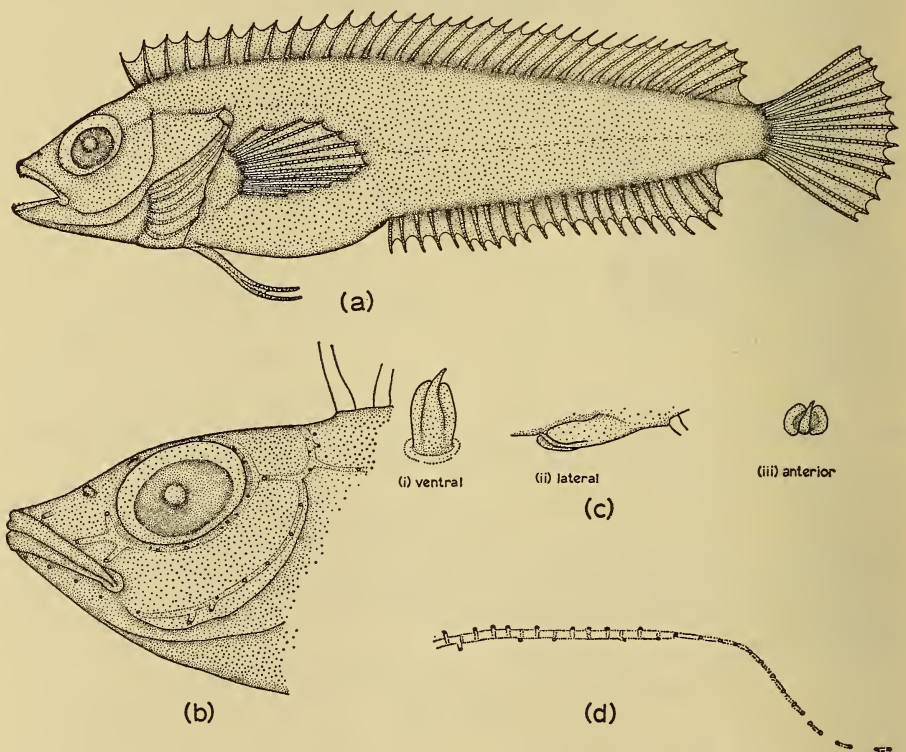


FIG. 34. *Pavoclinus (Pavoclinus) profundus*: (a) Lateral view, male, 43 mm, R.U.C., holotype; (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

Location of type material. Department of Ichthyology, Rhodes University, Grahamstown.

Material examined. 1 specimen, 43 mm in standard length, Knysna, 20 fms, R.U.C. (holotype).

Remarks. This species is known only from the holotype, and in spite of the lack of a marked dorsal crest it has so many features in common with the other members of the subgenus *Pavoclinus* that it is placed in that subgenus. Not least of these similarities is the form of the intromittent organ. The holotype was stated by Smith (1960) to be a female, but the specimen is clearly a male with an intromittent organ of a type very similar to that of the other species of *Pavoclinus*.

Distribution (fig. 27). Known from one locality, Knysna (34°03'S., 23°03'E); dredged in 20 fathoms from a rocky bank.

Subgenus *Smithichthys* Hubbs, 1952

Myxodes non Cuvier, Smith, 1945: 544 (type-species *Myxodes viridis* Valenciennes in Cuvier & Valenciennes).

Smithichthys Hubbs, 1952: 107 (type-species *Clinus fucorum* Gilchrist & Thompson).

Diagnosis. Vomer edentate; single row of teeth in each jaw. Snout upturned, puglike. First four or five dorsal spines elevated to form high, rounded dorsal crest. Body highly compressed. Scales minute, non-imbricating. Caudal peduncle elongate; caudal rays 13.

One species, *Pavoclinus* (*Smithichthys*) *fucorum* (Gilchrist & Thompson).

Pavoclinus (*Smithichthys*) *fucorum* (Gilchrist & Thompson, 1908)

(Fig. 35)

Clinus fucorum Gilchrist & Thompson, 1908: 121. Barnard, 1927: 853.

Myxodes fucorum: Smith, 1945: 544, 1949: 356, pl. 81 fig. 996.

Smithichthys fucorum: Hubbs, 1952: 107. Smith, 1953: 356, pl. 81 fig. 996.

Description D. XXVIII-XXXI (XXIX-XXX) 4-6 (5-6); A. II 19-21; P. 12-13 (12); V. I 3; C. 13. Vertebrae 15 + 28-29. First dorsal spine originates well forward, over hind margin of eye. First four or five dorsal spines elevated to form high rounded crest. No notch in dorsal fin membrane between any of the spines; all spines evenly placed. Dorsal spines of varying lengths, giving outline of fin markedly undulating appearance. Pectoral fin more or less rounded, upper edge somewhat straight. Inner pelvic ray stout, almost equal to others. Caudal peduncle long, length 47-62.5% head length, depth 23.5-30% head length. Caudal fin subtruncate, very large.

Body highly compressed, deep, covered with small embedded scales not extending on to fin bases or head, not overlapping. Depth 3.5-4 in standard length. Head 4-4.75 in standard length, snout rounded, upturned, puglike. Eye 3-5 in head. No supraorbital tentacle. Cirrus on anterior nostril short, with expanded trilobate tip. Upper jaw 32-42% head length. Lips fairly

thick. Vomer edentate; single row of teeth in each jaw. Sensory pores of head mostly single, a few double in supraorbital and suborbital series (fig. 35(b)).

Lateral line of single pores opening more or less medially in front to post-pectoral curve, then of short separate horizontal tubes with pore at either end (fig. 35(d)). Intromittent organ of male with moderate basal portion and long, conical tip, ensheathed basally by wing-like pair of dorso-lateral lips (fig. 35(c)).

Colouring. Uniform dark brown or olive, edges of fins lighter or transparent; two irregular translucent patches in caudal fin. A bright silvery iridescent spot behind pectoral fin. Uniform yellow preserved in alcohol.

Location of type material. South African Museum, Cape Town.

Lectotype. Male, 160 mm standard length, St. James, no other data, S.A.M. 25235.

Material examined. 13 specimens, 42–196 mm in standard length. 9 from St. James, False Bay, S.A.M. 25235 (lectotype), S.A.M. 10524 (paralectotypes),

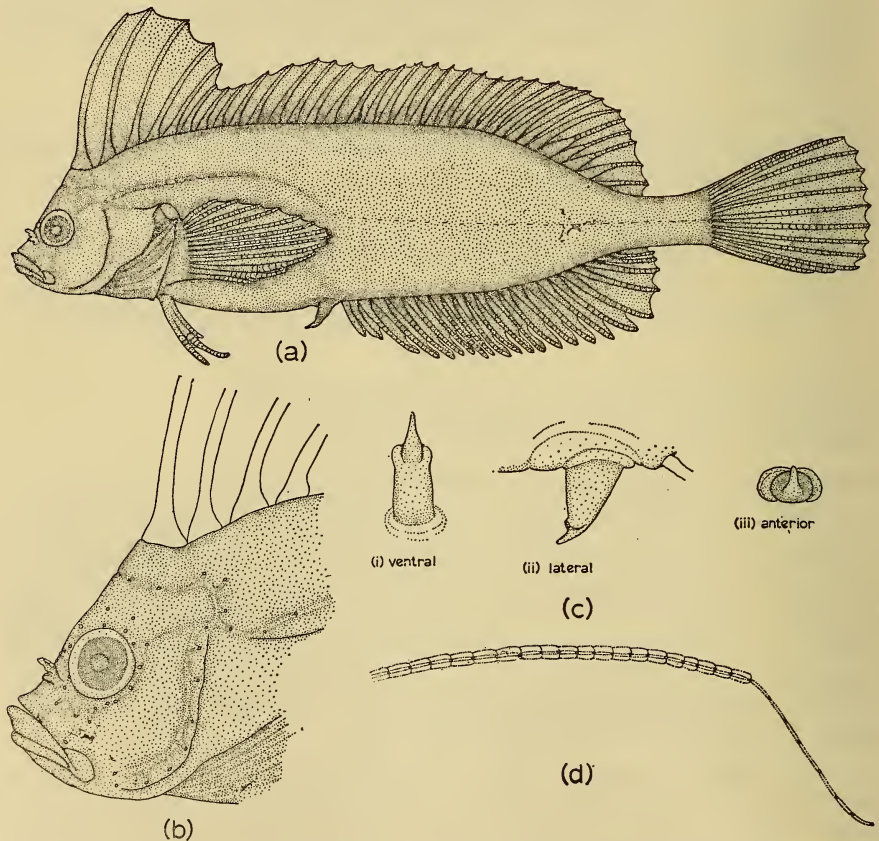


FIG. 35. *Pavoclinus* (*Smithichthys*) *fucorum*: (a) Lateral view, male, 101 mm, St. James, 16/5/1965, S.A.M.; (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

S.A.M. 12020, and 16/5/1965, S.A.M. not catalogued; 2 from Muizenberg, False Bay, S.A.M. 10525; 2 from Strandfontein, False Bay, S.A.M. 23886 and March, 1965, S.A.M. not catalogued.

Remarks. *Pavoclinus fucorum* is a peculiar, rare, highly specialised weed-dwelling species. It resembles *Pavoclinus mus* in lacking vomerine teeth, but otherwise differs from it in as many ways as it does from the members of the other subgenera of *Pavoclinus*.

Distribution (fig. 27). The known range is False Bay ($\pm 34^{\circ}10'S.$, $18^{\circ}50'E$) to the Bashee River ($31^{\circ}55'S.$, $28^{\circ}27'E$); rare, in sea-weed. At the bottom of the intertidal region and infratidal.

Genus BLENNIOCLINUS Gill, 1860

Blennioclinus Gill, 1860: 103 (type-species *Clinus brachycephalus* Valenciennes in Cuvier & Valenciennes, by monotypy).

Diagnosis: No supraorbital tentacle. Last dorsal spine about half length of first dorsal ray, deep notch in profile of dorsal fin before dorsal soft rays. Lateral line of double pores anteriorly to post-pectoral curve, then of short separate hori-

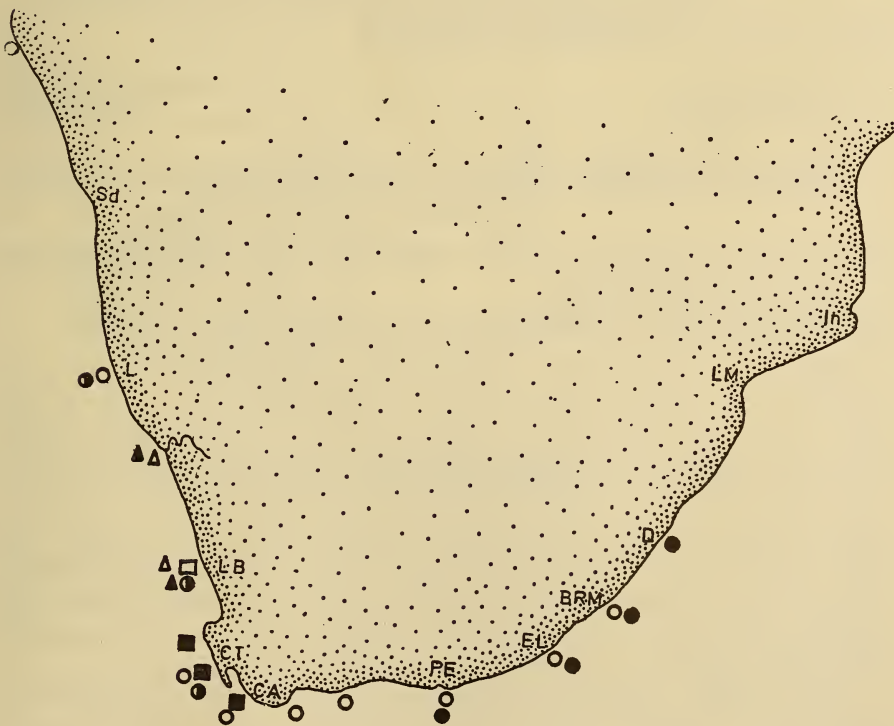


FIG. 36. Distribution of *B. brachycephalus* (open circles), *B. stella* (closed circles), *Clinoporus biporosus* (closed squares), *G. rotundifrons* (half-closed circles), *Cannelloxus burrelli* (open triangles), *X. leprosus* (closed triangles), *X. kochi* (open squares).

zontal tubes with pore at either end. Intromittent organ of male with short or moderate basal portion and long slender tip concealed between pair of very large lateral lips. Body covered with small embedded cycloid scales, not extending on to fin bases or head. First three dorsal spines elevated to form low crest. Notch in membrane between third and fourth dorsal spines. Clusters of cirri at tips of at least anterior dorsal spines. Vomer toothed. Head short, profile rounded.

Two species.

Discussion. The genus *Blennioclinus* was included by Smith (1945) in his Myxodinae on account of the lack of a supraorbital tentacle. However, the two species *brachycephalus* and *stella* are not weed-dwellers and are further set apart from the genus *Pavoclinus* by the notch in the profile of the dorsal fin before the dorsal soft rays, the clusters of cirri at the tips of the dorsal spines, the body form, the type of intromittent organ, and the high number of double pores in the anterior part of the lateral line. They differ from the genus *Clinus* mainly in having a notch before the dorsal soft rays, and in lacking a supraorbital tentacle. I therefore regard the genus *Blennioclinus* as distinct from the other clinid genera.

Distribution. West and east coasts of South Africa (fig. 36).

Key to the species of Blennioclinus

- | | | | | | | | |
|--------------------------|----|----|----|----|----|----|-------------------------------------|
| 1. 8-11 dorsal soft rays | .. | .. | .. | .. | .. | .. | <i>Blennioclinus brachycephalus</i> |
| 6-7 dorsal soft rays | .. | .. | .. | .. | .. | .. | <i>Blennioclinus stella</i> |

Blennioclinus brachycephalus (Valenciennes in Cuvier & Valenciennes, 1836)
(Fig. 37)

Clinus brachycephalus Valenciennes in Cuvier & Valenciennes, 1836: 371. Gilchrist & Thompson, 1908: 135. Barnard, 1927: 852.

Labrisomus linearis Swainson, 1839: 277.

Blennioclinus brachycephalus: Gill, 1860: 103. Smith, 1945: 543, 1949: 356; pl. 79 fig. 995.

Description. D. XXVI-XXX (XXVIII-XXIX) 8-11 (9-11); A. II 19-25 (21-24); P. 12-15 (13-14); V. I 3; C. 13. Gill-rakers in outer series on first arch 2-3 + 3-5. Vertebrae 17 + 28-30. First three dorsal spines slightly elevated, first spine 0-2 mm longer than fourth, crest very low. Third and fourth dorsal spines more widely spaced than others, very shallow notch in membrane between them. Dorsal spines decrease in height posteriorly, last spine very short, dorsal soft rays much higher; deep notch in profile of dorsal fin before dorsal soft rays. Clusters of 3-4 cirri at tips of most dorsal spines. Pectoral fin rounded. Inner pelvic ray short, slender. Caudal peduncle moderate, 35-40% head length, depth 23-31% head length. Caudal fin subtruncate.

Body slightly compressed, covered with minute embedded scales not extending on to dorsal, caudal, or anal fin bases or head. Depth 5-5.75 in standard length. Head short, bluntly rounded, 4-5 in standard length. Eye 2.5-3.5 in head. No supraorbital tentacle. Cirrus on anterior nostril flattened,

irregularly trilobed. Upper jaw 28.5–34% head length, mouth small. Lips thin. Vomer toothed. Sensory pores of head mostly double, with multiple pores mainly in occipital series (fig. 37(b)).

Lateral line of about 30–35 multiple pores in front to post-pectoral curve, then of short separate horizontal tubes with pore at either end (fig. 37(d)). Intromittent organ of male with moderate basal portion and slender tip ensheathed by large pair of lobed dorso-lateral lips (fig. 37(c)).

Colouring. Ground colour creamy fawn, much overlain with dark brown blotches and reticulations, denser dorsally. Belly creamy or bright yellow, with dark band running from isthmus towards vent, having broad dark symmetrical vertical branches running up to the densely mottled area above. Sometimes

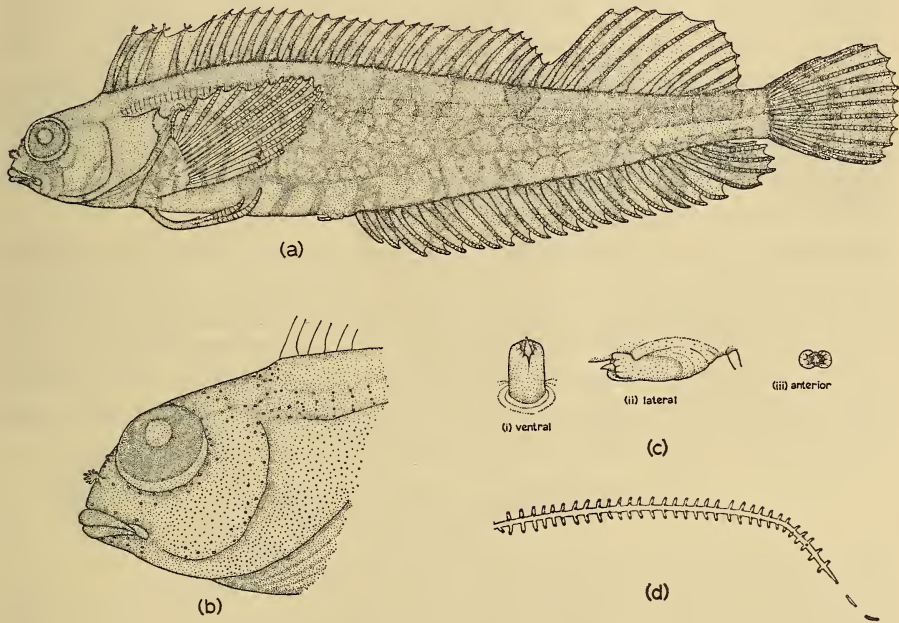


FIG. 37. *Blennioclinus brachycephalus*: (a) Lateral view, male, 73 mm, S.A.M. 23974; (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

fine orange stripes alternate with dark bands. A red-edged bright blue semi-circular spot behind pectoral fin. Head dark above to lighter brown below. Two mauve wavy lines on preopercle and opercle. Dark irregular band from below eye to angle of jaw. Spinous dorsal dark brown, with red tips to spines. Dorsal soft rays dark brown, membrane joining them cream barred with brown between first five rays, then plain cream. Anal fin with broad brown cross-bars, ground colour creamy, tips of rays red. Pectoral fin cream with dark brown cross-bars. Pelvic fins dark at base, then cream with two narrow red bars distally. Caudal fin cream with irregular dark brown markings. Branchiostegal

membranes mauve, with dark brown cross-bars. Juveniles plain dark red with longitudinal row of large silvery spots along side. Pattern remains defined for some time after preservation, slowly fading to yellow-buff.

Location of type material. Muséum National d'Histoire Naturelle, Paris.

Material examined. 223 specimens, 17–100 mm in standard length. 1 from Cape, Paris Museum Cat. No. A2013 (holotype); 12 from Lüderitzbucht, S.A.M. 24210; 2 from Simon's Bay, False Bay, S.A.M. 10534; 13 from Dalebrook, False Bay, 18/12/1964, 19/2/1965, 18/4/1965 and 16/5/1965, S.A.M. not catalogued; 2 from St. James, False Bay, S.A.M. 12014; 146 from Strandfontein, False Bay, S.A.M. 23875, S.A.M. 23953, S.A.M. 23970, S.A.M. 23974 and 20/11/1964 and 13/8/1964, S.A.M. not catalogued; 1 from Gordon's Bay, False Bay, S.A.M. 23293; 1 from Die Dam, Bredasdorp district, S.A.M. 25088; 25 from Still Bay, S.A.M. 18265, S.A.M. 25089; 1 from Port Elizabeth, S.A.M. 24244; 2 from East London, S.A.M. 18092; 2 from Kei Mouth, S.A.M. 25090.

Remarks. *Blennioclinus brachycephalus* is the more widely distributed and common of the two species of *Blennioclinus*. It is also the larger. The notched profile of the dorsal fin is interesting, since the same condition is found in some of the American Labrisominae, e.g. *Labrisomus* and *Malacoctenus*, but not in any of the other Clininae.

Distribution (fig. 36). Lüderitzbucht (26°38'S., 15°10'E) (South West Africa) to the Kei River (32°41'S., 28°23'E); locally common east of Cape Point, in pools at the low tide mark, usually among pebbles and sea-urchins. The species has not been found at any localities on the west coast between Melkbosch (west coast of Cape Peninsula) and Lüderitzbucht (Penrith, 1965*b*). The Lüderitzbucht specimens were all collected in sheltered areas, not on the open coast. They are in no way different from the south coast populations.

Blennioclinus stella Smith, 1945

(Fig. 38)

Blennioclinus stella Smith, 1945: 543, fig. 4, 1949: 386, pl. 79 fig. 994.

Description. D. XXIV–XXVIII 6–7; A II 19–21; P. 12; V. I 3; C. 13. Gill-rakers in outer series on first arch 1–2 + 4–6. Vertebrae 13 + 25–27. First three dorsal spines elevated to form low crest. Gap between third and fourth spines wider than between other spines; deep notch in membrane between third and fourth spines. Dorsal spines decrease in height posteriorly, last spine very short, dorsal soft rays much longer, resulting in deep notch in profile of dorsal fin before dorsal soft rays. Clusters of cirri at tips of first three dorsal spines. Pectoral fin rounded. Inner pelvic ray minute. Caudal peduncle short, length 27.5–33% head length, depth 27.5–33.5% head length. Caudal fin subtruncate.

Body slightly compressed, covered with small embedded scales not extending on to dorsal, caudal, or anal fin bases or head. Depth 5.25–5.75 in standard length. Head 3.75–5.25 in standard length, snout rounded. Eye 2.5–3.25 in

head. No supraorbital tentacle. Cirrus on anterior nostril elongate, narrow proximally, with tip expanded and deeply serrate. Upper jaw 37.5–47.5% head length. Lips moderately thick. Vomer toothed. Sensory pores of head mostly double, single in nasal, interorbital and in most of preopercular series (fig. 38(b)).

Lateral line of 20–25 vertical pairs of pores in front to post-pectoral curve, then of short separate horizontal tubes with pore at either end (fig. 38(d)). Intromittent organ of male with slender tip ensheathed by pair of large, flat ventro-lateral lips, with slightly serrate margins (fig. 38(c)).

Colouring. No live or unpreserved specimens seen. Smith (1945) described the colouring as 'variably brown, red and orange mottled. Three narrow bars

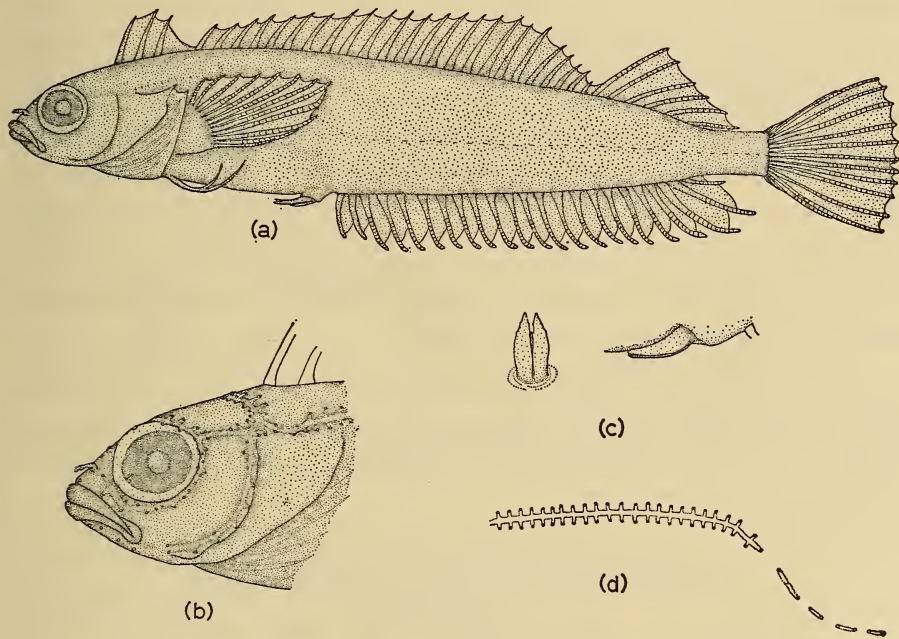


FIG. 38. *Blennioclinus stella*: (a) Lateral view, male, 39.5 mm, Xora, August 1947, R.U.C.; (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

across head, one through eye to cheek. Eight to ten cross-bars on body, spreading to dorsal fin. Sometimes iridescent silvery patches along flanks.' Two very small freshly preserved juvenile specimens examined were yellowish red, mottled and barred. Uniform yellow preserved in alcohol.

Location of type material. Department of Ichthyology, Rhodes University, Grahamstown.

Material examined. 7 specimens, 26–38 mm in standard length. 2 from Port Elizabeth, S.A.M. 24245; 3 from Cape Morgan, R.U.C.; 2 from Xora Mouth, August 1947, R.U.C.

Remarks. *Blennioclinus stella* is the smallest of the South African Clinidae. It is very similar to *Blennioclinus brachycephalus*, but can be distinguished from it by the lower number of dorsal soft rays.

Distribution (fig. 36). Port Elizabeth (33°58'S., 25°36'E) to Durban (29°53'S., 31°00'E); not common in southern part of range at least; usually in shallow pools at the bottom of the shore, among sand and pebbles (Professor J. L. B. Smith, personal communication).

Genus CLINOPORUS Barnard, 1927

Clinoporus Barnard, 1927: 864 (type-species *Clinus biporosus* Gilchrist & Thompson, by monotypy).

Diagnosis: Body and head without scales, elongate, robust. No supraorbital tentacle. Dorsal fin low, even, anterior spines not raised to form crest. Lateral line of large pores opening above and below line throughout, very broad and conspicuous. Pores on head large. Vomer toothed.

One species, *Clinoporus biporosus* (Gilchrist & Thompson).

Discussion. *Clinoporus* is a peculiar genus whose only known representative is infra- rather than intertidal. The lateral line is very distinctive and unlike that of any other clinid. The lack of scales is unique in the Clininae. C. L. Smith (1957) investigated the possibility of the degree of scaling of clinids being related to the amount of water movement in the environment of the adult, but concluded that the two factors are not correlated.

The inclusion of *Clinoporus biporosus* in the 'Myxodinae' by Smith (1945), together with *Pavoclinus*, *Blennioclinus* and *Gynutoclinus*, solely on the basis of the lack of a supraorbital tentacle is unjustifiable, since this species bears no resemblance to either the weed-dwellers of the genera *Pavoclinus* and *Gynutoclinus* or to the species of *Blennioclinus*.

Clinoporus biporosus (Gilchrist & Thompson, 1908)

(Fig. 39)

Clinus biporosus Gilchrist & Thompson, 1908: 137.

Clinoporus biporosus: Barnard, 1927: 864. Smith, 1945: 545, 1949: 358, pl. 82 fig. 1003.

Description. D. XXXVIII-XLI 3; A. II 27-28; P. 12-13; V. I 3; C. 13. Vertebrae 17 + 32-35. Dorsal fin low, even, no notch in membrane between third and fourth dorsal spines. No clusters of cirri at tips of dorsal spines. Pectoral fin rounded. Inner pelvic ray minute. Caudal peduncle short, length 23-26% head length, depth 28.5-31% head length. Caudal fin subtruncate.

Body robust, elongate, naked. Depth 6.25-6.85 in standard length. Head 4.5-6.25 in standard length, snout rounded. Sensory pores large and conspicuous, mostly single (fig. 39(a)). Eye 2.75-4.25 in head. No supraorbital tentacle. Cirrus on anterior nostril small, flaplike. Upper jaw 34-43% head length. Lips moderately thick. Vomer toothed.

Lateral line throughout of large pores opening above and below line, close together and numerous; line broad; ends in single pore on caudal peduncle (fig. 39(a)). Intromittent organ of male with moderate basal portion and small tip protruding between two rounded ventral lips (fig. 39(b)).

Colouring. No fresh specimens seen; uniform red, brown or orange (Smith, 1949). Uniform buff preserved in alcohol.

Location of type material. South African Museum, Cape Town.

Lectotype. Female, 117 mm, St. James, S.A.M. 25241.

Material examined. 7 specimens, 46–116 mm in standard length. 3 from Saldanha Bay, S.A.M. 18463; 2 from St. James, False Bay, S.A.M. 25241 (lectotype),

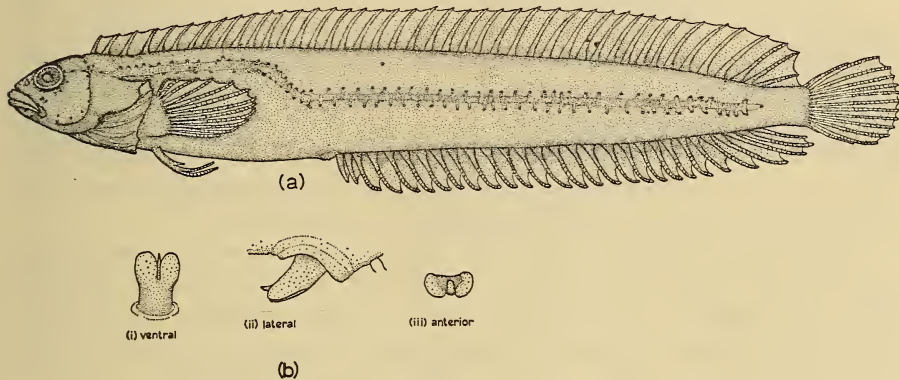


FIG. 39. *Clinoporus biporosus*: (a) Lateral view, female, 117 mm, S.A.M. 25241, lectotype; (b) Intromittent organ of male.

S.A.M. 10529 (paralectotype), 1 from False Bay, 14 fathoms, S.A.M. 10528 (paralectotype); 1 from False Bay, dredged, S.A.M. 23949.

Distribution. Saldanha Bay (33°00'S., 17°56'E) to False Bay ($\pm 34^{\circ}10'S.$, 18°50'E) is the known range. Rare, mainly infratidal.

Genus GYNUTOCLINUS Smith, 1945

Gynutoclinus Smith, 1945: 545 (type-species *Clinus rotundifrons* Barnard, by monotypy).

Diagnosis: A minute simple papilla over eye. Body highly compressed. Head spherical, inflated, with pores opening on prominent papillae. Body covered with minute, embedded, cycloid scales, which do not extend on to median fin bases or head. Lateral line of single, more or less medially opening pores in front to post-pectoral curve, then of short separate horizontal tubes with pore at either end, becoming obscure caudally. Intromittent organ of male with long basal portion; tip ensheathed by two pairs of lips. Vomer toothed.

A single, rare species, *Gynutoclinus rotundifrons* Barnard.

Gynutoclinus rotundifrons (Barnard, 1937)
(Fig. 40)

Clinus rotundifrons Barnard, 1937: 63, fig. 4.

Gynutoclinus rotundifrons: Smith, 1945: 545, 1949: 358, fig. 1002. Penrith, 1965a: 215, figs 3, 4.

Description. D. XXX-XXXII 8; A II 22-23; P. 12-14; V. I 3; C. 13. Vertebrae 16 + 28-29. First four dorsal spines slightly elevated to form low, rounded crest, second and third spines highest. All spines evenly placed. No clusters of cirri at tips of dorsal spines. No notches in membrane between any of the dorsal spines. Profile of dorsal fin undulating. Pectoral fin rounded. Inner pelvic ray reduced, not more than half other two rays. Caudal peduncle short, length 28.6-36.4% head length, depth 27.5-32% head length. Caudal fin subtruncate.

Body highly compressed, deepening with age, covered with small scales not extending on to bases of dorsal, caudal, or anal fins, or head. Depth 3.5-5.2 in standard length. Head 3.7-4.15 in standard length, spherical, inflated, broad, with pores opening on raised papillae. Eye 3.5-5 in head. Minute simple papilla over eye. Anterior nostril tubular, cirrus large, flat, deeply bilobed. Posterior nostril conspicuous, surrounded by short skinny lobes. Upper jaw 42.5-54.5% of head length. Lips very thin. Vomer toothed. Sensory pores of head mostly double (fig. 40(b)), opening on raised papillae.

Lateral line of single, more or less medially opening pores in front to post-pectoral curve, then of short, separate horizontal tubes with pore at either end (fig. 40(d)), obsolete on caudal peduncle on largest specimen, the holotype. Intromittent organ of male with long basal portion and a clubshaped tip, ensheathed by pair of thin, crescentic lateral lips and minute pair of more or less confluent dorsal lips (fig. 40(c)).

Colouring. Male from Lambert's Bay: ground colour pale brown with about seven darker brown irregular cross-bars, edged with iridescent blue fine broken lines. A very dark brown, narrow, vertical line behind and above the pectoral axil, and another at end of caudal peduncle. Cross-bars continued on to dorsal fin, with translucent patches between; small black dots on translucent areas. Dorsal fin dark brown posteriorly, with single small translucent patch near beginning of dorsal soft rays at base. Caudal fin translucent, with very faint brown cross-bars, darkening at margins so that margins appear to be spotted. Pectoral fin translucent with four very fine dark cross-bars, proximal one curved. Anal fin mainly dark brown, with two translucent patches. Head mainly light brown below. Dark stripe from below eye forwards in front of inflated cheek to angle of jaw. Head above and opercular region deep pink. Snout pink with darker pink bar between eyes and another above upper lip; fine darker pink line down middle. Eye silvery with brown radii. Chin and lips light brown mottled heavily with darker brown. Branchiostegal membranes and jugular region silvery grey with fine black speckling. Pelvic fins light brown with dark brown cross-bars. Belly silvery with golden brown sheen. Intromittent organ greyish with fine black speckling. Juvenile from Lambert's Bay yellow, under-

parts lighter. Dorsal fin with alternating pink and translucent patches. Anal fin yellow. Caudal and pectoral fins translucent. Pelvic fins yellow with brown cross-bars. Uniform pinkish to yellow preserved in alcohol.

Location of type material. South African Museum, Cape Town.

Material examined. 8 specimens, 26–95 mm in standard length. 1 from Lüderitzbucht, S.A.M. 25091; 2 from Lambert's Bay, S.A.M. 24007, S.A.M. 24082; 4 from Lambert's Bay, R.U.C.; 1 from Oudekraal, Cape Peninsula, S.A.M. 18587 (holotype).

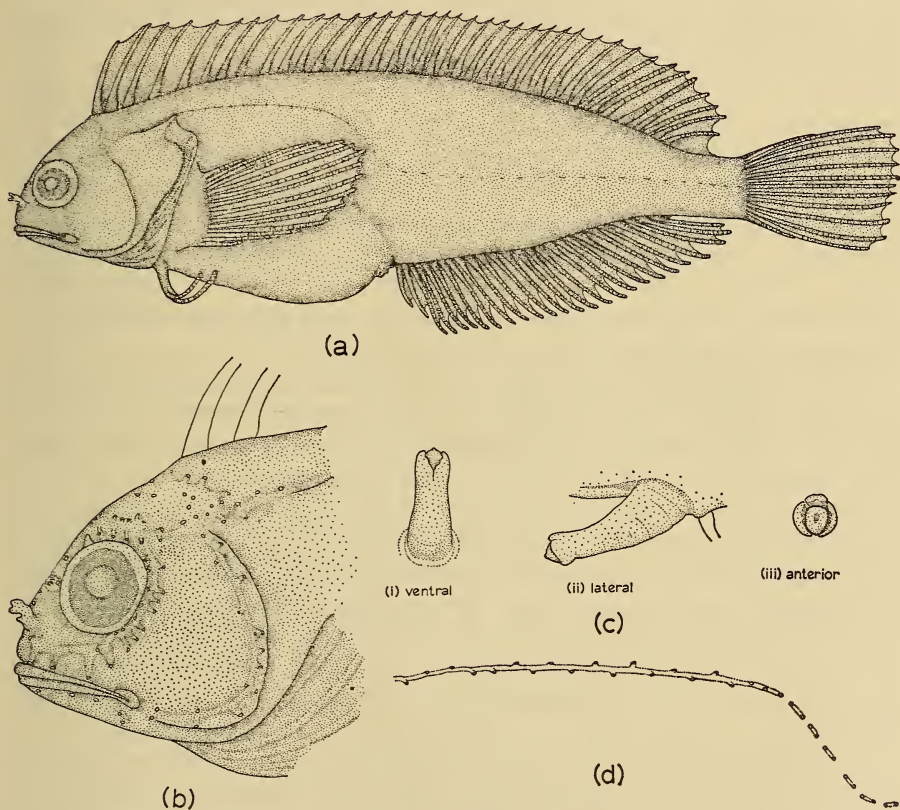


FIG. 40. *Gynutoclinus rotundifrons*: (a) Lateral view, female, 85 mm, S.A.M. 18587, holotype; (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

Remarks. This very rare species does not appear to be very close to any of the other species, although it has certain modifications for a weed-dwelling habit such as the strong compression of the body. It is known from eight specimens, four in the South African Museum, and four in the Rhodes University Ichthyology Department, the latter taken from the stomachs of sea-birds at Lambert's Bay and therefore in rather poor condition. The species was included by Smith

(1945) in the 'Myxodinae', but in fact it has a small supraorbital tentacle, although this is not very distinct in the long-preserved holotype. The tentacle is quite prominent in fresh specimens. The intromittent organ of this species is very similar to the type found in the genus *Clinus*.

Distribution (fig. 27). The known range is Lüderitzbucht ($26^{\circ}38'S.$, $15^{\circ}10'S$) to Cape Point ($34^{\circ}21'S.$, $18^{\circ}29'E$); in kelp at the bottom of the shore. Apparently very rare.

Subtribe XENOPOCLINIDI Hubbs, 1952

Diagnosis: Clinini with hook on pectoral girdle sometimes reduced or absent. Head depressed; eyes dorsal. Pelvic fins of three slender, equal rays, united from base to tips by membrane. Dorsal fin low, even.

Discussion. Smith (1947*b*) described a new genus and species of clinid, *Xenopoclinus kochi*, from a rock-pool at Lambert's Bay on the south-western Cape coast approximately 200 miles north of Cape Town. He placed this species in the family Clinidae, but distinguished it by creating for it a separate 'subfamily' (equivalent to a subtribe in Hubbs' 1952 classification). Subsequently another genus and two more species, *Xenopoclinus leprosus* and *Cancelloxus burrelli*, obviously closely related to *Xenopoclinus kochi*, were described from the Lambert's Bay area by Smith (1961). Smith then separated the three species from the Clinidae and created for them a new family, Xenopoclinidae.

The three species are all adapted to a sand-burrowing existence. The body is elongate, and the head is depressed, with the eyes in a dorsal, anterior position. The pectoral fins are pointed, the middle rays being longer, and are used in sweeping back the sand when burrowing. The jugular pelvic fins consist of a minute spine and three rays of about equal length joined by a membrane that extends well up between them, having the appearance of an amphibian webbed foot. In *Xenopoclinus kochi*, but not in the other species, the opercular membranes are expanded and overlap below. The opercular membranes of *Cancelloxus burrelli* are expanded slightly above to form a fold over the pectoral axil.

In other respects they are much like the South African Clinidae. The scales are minute, embedded, and cycloid. The jaw teeth are conical and fixed, with usually a row of villiform teeth behind, at least at the jaw symphyses. The two species of *Xenopoclinus* have teeth on the vomer, but in *Cancelloxus* the vomer is edentate. There are no palatine teeth. The lateral line canals on the head are covered; the lateral line itself is variable. In *Xenopoclinus kochi* the lateral line follows a similar course to that of the Clinidae but is interrupted behind the level of the pectoral fin, so that the anterior, dorsal portion is separate from the posterior, mid-lateral portion. In *Xenopoclinus leprosus* the lateral line is similar to that of the Clinidae, with no interruptions. In *Cancelloxus burrelli* the lateral line is continuous, but curves down very much more gently than in the other species to a mid-lateral position.

The dorsal fin is low and continuous, the anterior spines being the shortest, and there are many more spinous than soft elements. There are two anal spines.

All the soft fin rays are unbranched. The gill membranes are united, forming a fold across the throat. There are six branchiostegal rays on either side. *Xenopoclinus kochi* has an upturned, hook-like process on the anterior border of the pectoral girdle, but the other species show reduction or absence of this feature. The young are born alive, and the male has a fleshy penis for the transmission of sperm.

The question arises as to whether these three species, which have so much in common with the South African Clinidae, should be placed in a separate family.

Smith (1961) differentiated the Xenopoclinidae from the Clinidae by the following characters: (i) the peculiar head, (ii) the expanded opercular membrane, (iii) the form of the pelvic fins, and (iv) the greater relative length of the anal fin.

The form of the head and pelvic fins are associated with the sand-burrowing habit of these fishes. The expanded opercular membranes occur only in one of the three species, so cannot be considered as a strong differentiating character. The species which shows this feature burrows in finer sand than the other two species, and may have developed the expanded opercular membranes as a result of this.

The meaning of the greater 'relative' length of the anal fin is not entirely clear. The length of the anal fin base, about 60% standard length, is somewhat greater in the Xenopoclinidi than in the South African Clinidi, about 40-50%. This 10% difference seems hardly great enough to warrant separation at the family level, in view of the considerable similarities between the two groups. However, it is probable that by 'relative' length of the anal fin Smith (1961) meant the number of anal elements relative to the degree of elongation of the body as reflected by body depth in standard length. If this is the case, then the anal fin is not relatively longer in the Xenopoclinidi than in the elongate species of South African Clinidi. *Xenopoclinus kochi* and *X. leprosus*, with a body depth of 6-8, have 29-30 and 28-34 anal rays respectively; *Clinus capensis*, with a body depth of 5-6, has 26-34 anal rays, *C. dorsalis*, body depth 5.5-7, has 25-31; and *C. anguillaris*, the most elongate of the South African Clinidi, with a body depth of 6-8, has 33-37 anal rays. *Cancelloxus burrelli* has a greater number of anal rays (38-43) than any of the South African Clinidi, but the body depth is 8-11, greatly elongated in comparison with the other species. If only the number of anal rays is considered, with no regard for the elongation of the body, then *Cancelloxus burrelli* certainly has a longer anal fin than any of the South African Clinidi, but the anal counts of *Xenopoclinus kochi* and *X. leprosus* fall well within the ranges found among the South African Clinidi.

It seems, then, that the differences between the South African Clinidi and the Xenopoclinidi are those concerned with the adaptation of the Xenopoclinidi to a burrowing existence; the depressed head with dorsally placed eyes, the modified pelvic and pectoral fins, and the expansion of the opercular membranes of *Xenopoclinus kochi*.

Owing to the large number of features which the Xenopoclinidi share with the Clinidi, particularly with the South African species, it is felt that separation at the family level is unjustified, since it serves only to obscure the obvious similarity of the two groups of species. That the Xenopoclinidi were derived from the South African Clinidi, or at least from a common ancestor which had already developed internal fertilization and a penis in the male, seems very probable in view of the similarities of the two groups, particularly with regard to the reproductive organs. Although the hook on the pectoral girdle, so characteristic of the Clininae, is apparently in the process of being lost in the Xenopoclinidi, it is invariably present in *Xenopoclinus kochi*, and traces of it are present in the other species. Sixteen specimens of *Cancelloxus burrelli*, including the

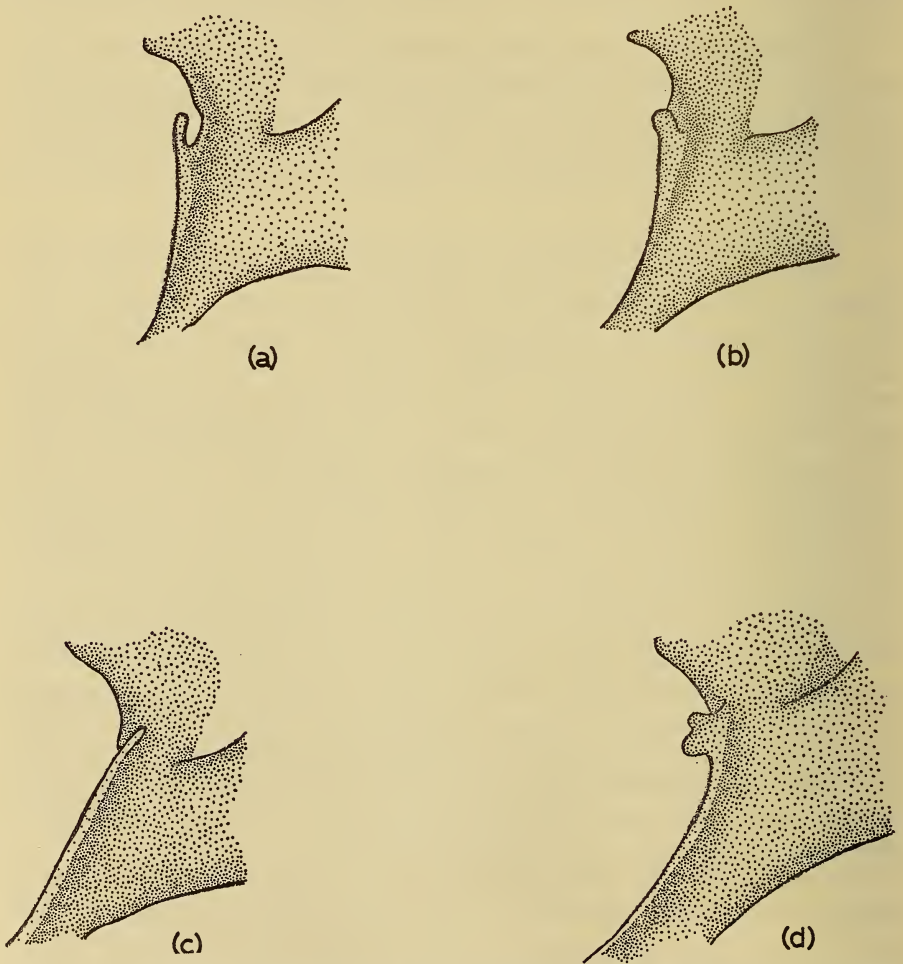


FIG. 41. Anterior border of cleithrum of: (a) *Clinus superciliosus*; (b) *Xenopoclinus kochi* (c) *Xenopoclinus leprosus*; (d) *Cancelloxus burrelli*.

holotype, were examined, all of which had a projecting bony lamina on the anterior border of the pectoral girdle. Of a sample of 89 specimens of *Xenopoclinus leprosus* examined, 32 had a small knob-like process on the anterior border of the pectoral girdle. This feature is illustrated in figure 41.

Hubbs (1952) gave Smith's (1949) subfamily Xenopoclininae the status of a subtribe of the Clinini. He named the subtribe 'Xenopoclinini'. It is proposed here that this arrangement should be adopted, and that the three species *Xenopoclinus kochi*, *X. leprosus* and *Cancelloxus burrelli* be placed in the subtribe Xenopoclinidi.

The resemblance the Xenopoclinidi bear to the American sand-burrowing family known as the Dactyloscopidae is at first sight startling. The head, pectoral fins, and particularly the pelvic fins are strikingly similar in the two groups. Smith (1961) noted this resemblance, but pointed out that they differ in that the Xenopoclinidi have vomerine teeth (two of the three species), many more dorsal spines than dorsal soft rays, small, embedded, non-imbricate scales, united gill membranes forming a fold across the throat, and at least some vestige of a hook on the pectoral girdle; on the other hand, they lack skinny fringes on the opercle and lips, which are characteristic of the Dactyloscopidae. The Xenopoclinidi differ further from the Dactyloscopidae in having a generally more elongate body, unbranched caudal rays, the uppermost pectoral ray articulating with a pectoral radial (it articulates with the scapula in the Dactyloscopidae, Dr. V. G. Springer, personal communication), the ectopterygoid and mesopterygoid distinct (these two bones are fused in the Dactyloscopidae, Dr. V. G. Springer, personal communication), and a fleshy penis in the male.

Key to the genera of the Xenopoclinidi

1. Vomer toothed. Lateral line curves down sharply behind pectoral fin, may be discontinuous over curve. A simple papilla or flap above the eye *Xenopoclinus*
 Vomer edentate. Lateral line curves down very gently from front to median position. No papilla or flap above the eye *Cancelloxus*

Genus XENOPOCLINUS Smith, 1947

Xenopoclinus Smith, 1947b: 732 (type-species *Xenopoclinus kochi* Smith, by monotypy).

Xenopoclinops Smith, 1961: 354.

Diagnosis. A disc-like, fleshy papilla or simple flap over eye. Body elongate, compressed, covered with minute embedded cycloid scales not extending on to median fin bases or head. Vomer toothed. Lateral line curves down sharply to medial position behind pectoral fin, discontinuous over curve.

Discussion. Smith (1961) divided this genus into two subgenera on the basis of the presence or absence of a hook on the pectoral girdle, and whether or not the opercular membranes were expanded and overlapped below. However, I believe that, as suggested by Huxley (1940), the primary purpose of subgenera is to indicate relationships between pairs or groups of species in genera, and

therefore that the use of the subgeneric rank in a genus containing only two species is not warranted. The two species included in the genus *Xenopoclinus* are obviously more closely related to one another than to the species for which the other genus, *Cancelloxus*, was erected, and therefore should be included in one genus.

Key to the species of Xenopoclinus

- | | | | | | | | | | |
|--|---------|---------|---------|---------|---------|---------|---------|---------|------------------------------|
| 1. Hook on pectoral girdle well developed. Opercular membranes expanded, overlapping below | .. .. . | .. .. . | .. .. . | .. .. . | .. .. . | .. .. . | .. .. . | .. .. . | <i>Xenopoclinus kochi</i> |
| Hook on pectoral girdle reduced to a small knob, or absent. Opercular membranes not expanded and overlapping below | .. .. . | .. .. . | .. .. . | .. .. . | .. .. . | .. .. . | .. .. . | .. .. . | <i>Xenopoclinus leprosus</i> |

Xenopoclinus kochi Smith, 1947

(Fig. 42)

Xenopoclinus kochi Smith, 1947b: 732, fig. 1, 1949: 358, fig. 1004.

Xenopoclinus (Xenopoclinus) kochi: Smith, 1961: 352, fig. 2.

Description. D. XXXIII-XXXVII (XXXIV-XXXV) 8-11 (9); A. II 29-30; P. 12-13 (12); V. I 3; C. 13. Gill-rakers in outer series on first arch 2 + 0-2. Vertebrae 15 + 34-35. Dorsal fin low, even, anterior spines shortest. Third spine a little shorter than first or fourth. No notch in membrane between third and fourth dorsal spines; spines evenly placed. Soft dorsal rays a little longer than spines. Spines fairly soft. No clusters of cirri at tips of dorsal spines. Pectoral fin with central rays elongate, upswept, fin pointed; lower rays short, curling forward. Pelvic fin of three rays, equal in length, united by membrane from base to tips, resembling a frog's foot. Caudal peduncle short, length 30-40% head length, depth 25-35% head length. Caudal fin subtruncate.

Body elongate, compressed, covered with minute embedded scales not extending on to bases of dorsal, caudal, or anal fins, or head. Depth 6-7.5 in standard length. Head depressed, 3.75-5 in standard length. Snout subacute. Lower jaw projects. Eyes dorsally situated, almost adjacent, 4-6.5 in head. Flat, fleshy papilla over eye. Anterior nostril tubular, cirrus short simple flap. Upper jaw 30-40% head length. Lips moderate. Vomer toothed. Sensory pores of head mostly double, multiple pores in postorbital region (fig. 42(b)). Opercular membranes expanded, overlapping below.

Lateral line of mostly vertical pairs of pores in front to behind pectoral fin; ends abruptly there and is continued below in the mid-lateral line, consisting of short separate horizontal tubes with pore at either end (fig. 42(d)). Intromittent organ of male with long basal portion and rounded tip ensheathed below by two rounded ventro-lateral lips and above by hood-like fold (fig. 42(c)).

Hook on anterior edge of pectoral girdle well developed.

Colouring. Ground colour stony pinkish mauve with about six irregular olive green cross-bars, running into vague olive mottling posteriorly. Cross-bars edged with darker olive. On head behind eyes are two adjacent olive rings. Fins hyaline except dorsal, where olive cross-bars may continue on to fin.

Pectoral base olive. Belly whitish. Dark olive bar at caudal base. Two dark olive blotches on preopercle, sometimes lighter one between; olive stripe from front of eye to upper lip on either side. Speckled and mottled all over body and head with silvery white. Cross-bars more distinct in juveniles. Pupil black, iris gold; papilla over eye white. Pattern retained for some time after preservation.

Location of type material. Department of Ichthyology, Rhodes University, Grahamstown.

Material examined. 13 specimens, 26–73 mm in standard length. 8 from Lambert's Bay, S.A.M. 24667; 5 from Lambert's Bay and Doring Bay, R.U.C. (including holotype).

Distribution (fig. 36). Known only from Lambert's Bay and Doring Bay in southern Namaqualand ($\pm 32^{\circ}00'S.$, $18^{\circ}20'E.$). Not common, in pools and gullies at the bottom of the intertidal zone with much kelp. Burrows in fairly coarse shingly sand.

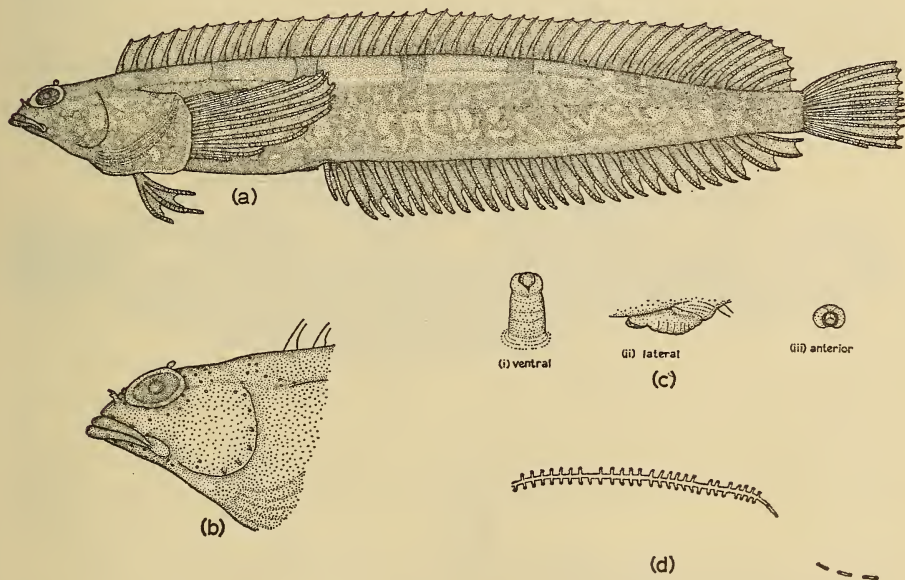


FIG. 42. *Xenopoclinus kochi*: (a) Lateral view, female, 72 mm, S.A.M. 24667; (b) Head pore system; (c) Intramittent organ of male; (d) Lateral line.

Xenopoclinus leprosus Smith, 1961

(Fig. 43)

Xenopoclinus (*Xenopoclinops*) *leprosus* Smith, 1961: 354, fig. 3.

Description. D. XXXII–XXXVI (XXXIV–XXXV) 7–12 (9–11); A. II 28–34 (31–32); P. 11–13 (11–12); V. I 3; C. 13. Gill-rakers in outer series on first arch 1–2 + 2–5. Vertebrae 15 + 35–36. Dorsal fin low, even, spines

increasing in height posteriorly. Third spine a little lower than fourth or second first may be slightly higher, especially in juveniles. Soft dorsal rays a little longer than spines. Spines soft. Pectoral fin not elongate, slightly upswept, lower rays thickened. Pelvic fin of three equal rays joined throughout length by membrane, resembling a webbed foot. Caudal peduncle short, length 20–33% head length, depth 20–33% head length. Caudal fin subtruncate.

Body elongate, compressed, covered with minute embedded scales not extending on to dorsal, caudal, or anal fin bases or head. Depth 6.25–8.75 in standard length. Head depressed, 4.75–5 in standard length in adults, 4–4.5 in standard length in juveniles. Snout subacute. Eyes dorsal, adjacent, 4–6.5 in head. Flattened, flaplike tentacle over eye, edge irregularly and shallowly notched. Anterior nostril tubular, cirrus flaplike, sometimes terminally notched. Upper jaw 33–43.5% head length. Lips moderate. Vomer toothed. Opercular membranes normal, not expanded or overlapping below. Sensory pores of head mostly double (fig. 43(b)).

Lateral line of vertical pairs of pores and single pores in front to post-pectoral curve, where it ends abruptly; continued in mid-line as short separate horizontal tubes with pore at either end, very obscure in most specimens (fig. 43(d)). Intromittent organ of male with fairly long basal portion and short tip ensheathed by pair of united ventral lips (fig. 43(c)).

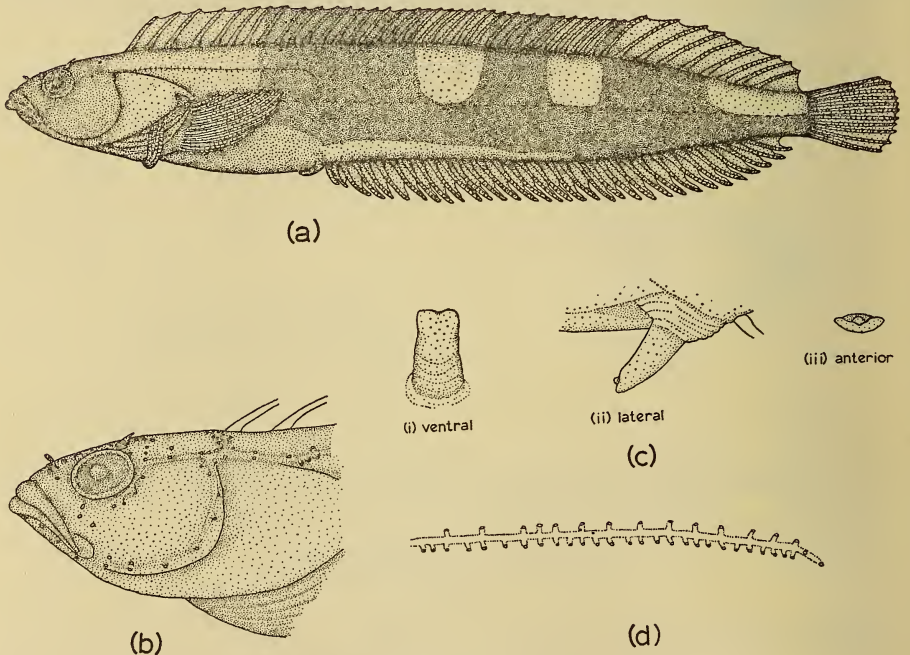


FIG. 43. *Xenopoclinus leprosus*: (a) Lateral view, male, 62 mm, S.A.M. 24668; (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

Hook on anterior border of pectoral girdle usually absent; if present, reduced to small knob.

Colouring. Ground colour light brown below grading to chocolate above. Three large white saddles in upper half of body. Head white, except for an area, enclosed by a line on each side from dorsal origin to eye and from eye vertically down cheek, which is sand-coloured in life, becoming dark brown or jet black on preservation in spirit. Pectoral base yellow. Dorsal fin brown above dark areas on body, hyaline above white saddles. Other fins hyaline. Iris golden, pupil jet black. Belly light brown to cream. Pattern retained on preservation although colours fade.

Location of type material. Department of Ichthyology, Rhodes University, Grahamstown.

Material examined. 95 specimens, 22–68.5 mm in standard length. 1 off Orange River Mouth, 10 fathoms, U.C.T.; 89 from Lambert's Bay, S.A.M. 24668; 5 from Lambert's Bay, R.U.C. (holotype and paratypes).

Distribution (fig. 36). The known range is Orange River Mouth (28°38'S., 16°24'E) (infratidal, dredged) to Lambert's Bay (32°04'S., 18°20'E) (in intertidal pools and gullies at lowest levels of shore). Burrows in very coarse shingle and broken mussel shells. Fairly common but patchily distributed.

Cancellopus burrelli Smith, 1961

(Fig. 44)

Cancellopus burrelli Smith, 1961: 355, figs 1, 4.

Description. D. XXXIV–XXXIX (XXXVI–XXXVII) 10–14 (10–13); A. II 38–43 (41); P. 13–15 (13–14); V. I 3; C. 13. Gill-rakers in outer series on first arch 0–2 + 5–8. Vertebrae: females 20–21 + 44–45, males 19 + 43–46. Dorsal fin low, even, anterior spines lowest, soft rays a little higher than spines. Spines soft. Pectoral fin with middle rays elongate, pointed and upswept, lower rays thickened. Pelvic fin of three equal rays, joined from bases to tips by membrane, resembling a webbed foot. Dorsal fin originates well behind head. Caudal peduncle short, length 23.5–31% head length, depth 20–28.5% head length. Caudal fin subtruncate.

Body elongate, compressed, covered sparsely with minute scales not extending on to dorsal, caudal, or anal fin bases, or head. Depth 8–11 in standard length. Head depressed, 4.25–5.5 in standard length, snout pointed. Eyes oval, adjacent, 3.75–4.75 in head. No tentacle or papilla over eye. Anterior nostril tubular, cirrus small simple flap. Upper jaw 26–29% head length. Lips fairly thick. Lower lip produced at symphysis into acute process. Vomer edentate. Few or no teeth at sides of jaw, patch at each symphysis. Opercular membranes normal, not expanded or overlapping below. Sensory pores of head mostly single, opening flush with skin surface (fig. 44(b)).

Lateral line of single pores opening more or less medially in front, then of short separate horizontal tubes with pore at either end, sloping gradually to

mid-line behind pectoral fin (fig. 44(d)). Intromittent organ of male extremely large. Basal portion long and stout, terminating anteriorly in pair of horn-like lobes between which tip protrudes. Tip conical, curving up towards belly. Flat fleshy lobe dorsally at base of tip. Belly of male deeply grooved. Intromittent organ illustrated in fig. 44(c). Vent of female large and crescent-shaped, surrounded by fleshy fold produced posteriorly into two lobes, one on either side of first anal spine. Each lobe with thick fleshy dorsal portion overlaid by thin skinny lobe ventrally.

Colouring. Ground colour cream, semi-translucent. Bright silver broken stripe mid-laterally. Irregular olive patches above. Eleven olive saddles above, edged darker. Olive stripe from eye to posterior edge of opercle; below this stripe a broad silver stripe. Lips and underparts cream. Pectoral base silver. Fins hyaline. Pupils jet black, iris narrow and golden. In alcohol the ground colour becomes opaque and the olive turns golden brown, later fades completely.

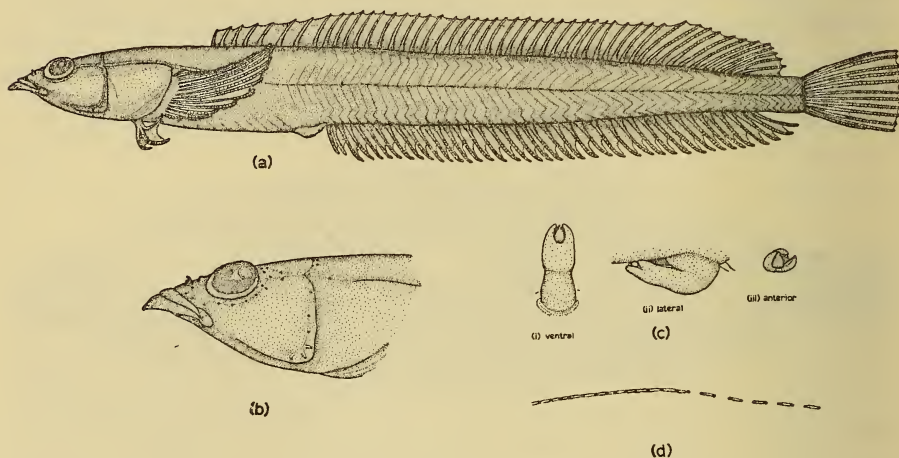


FIG. 44. *Cancelloloxus burrelli*: (a) Lateral view, female, 105 mm, S.A.M. 24669; (b) Head pore system; (c) Intromittent organ of male; (d) Lateral line.

Location of type material. Department of Ichthyology, Rhodes University, Grahamstown.

Material examined. 19 specimens, 75.5–107 mm in standard length. 1 from off Orange River Mouth, 5 fathoms, S.A.M. 23272; 1 from Lambert's Bay, R.U.C. (holotype); 3 from Lambert's Bay, R.U.C. (paratypes); 14 from Lambert's Bay, S.A.M. 24669.

Distribution (fig. 36). The known range is Orange River Mouth (28°38'S., 16°24'E.) (infratidal, 5 fathoms) to Lambert's Bay (32°04'S., 18°20'E.), mainly in gullies and inlets open to the sea at the base of the intertidal zone, in coarse shingle. Not common.

ORIGIN OF THE SOUTH AFRICAN CLINIDAE

The presence of a hooklike projection on the anterior border of the cleithrum, small scales with radii on all margins, and the very similar general appearance of the less specialized members of both groups, point to a common origin of the Myxodini and the Clinini. Hubbs (1952) considered the Myxodini to be ancestral to the Clinini because the Myxodini are oviparous, fertilization is external, and there is no intromittent organ in the male.

The derivation of the South African species from the most generalized of the American myxodids, the species of the genus *Gibbonsia*, would not be difficult. If one of the American species such as *Gibbonsia metzi* C. L. Hubbs were to develop viviparity, the result would be a clinid very similar to some of the more generalized South African clinids such as *Clinus robustus*. I examined specimens of *Gibbonsia*, *Myxodes*, and *Heterostichus*, and, apart from the lack of an intromittent organ in the male, they are strikingly similar to the South African clinids.

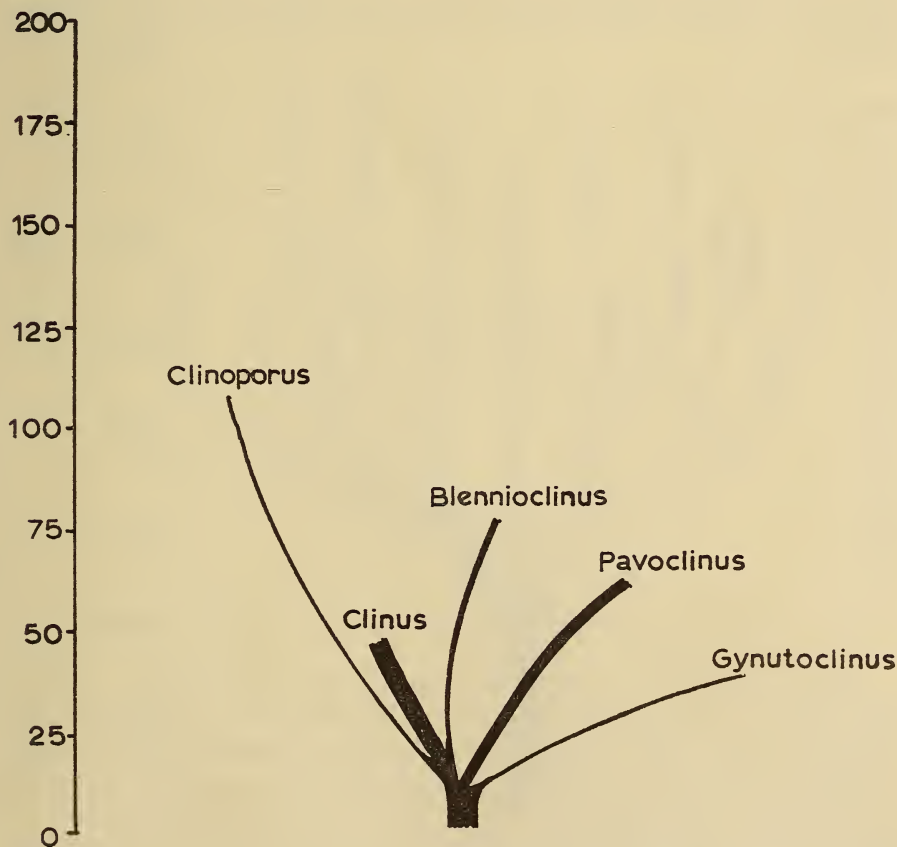


FIG. 45. Hypothetical intergeneric relationships of South African Clinidi.

In a consideration of the origins of a group it is often difficult to decide which characters are primitive and which are advanced. Table 8 gives what I consider to be the primitive condition for twenty characters which have been used in my study. In some cases the definition of the primitive condition is based on the statements of Hubbs (1953*b*) regarding typically clinid characters, and in others on the conditions prevailing in the genus *Gibbonsia*.

Of the two subtribes of Clinini represented in South Africa, the Clinidi have by far the greatest representation, with five genera and 30 species in South African waters. The genera apparently represent two major lines of evolution and three minor ones. The hypothetical interspecific relationships are shown in figure 45. The method used for devising the figure is similar to that used by Stephens (1963). The lateral position is based purely on morphological resemblance and the horizontal distances are arbitrary, but the vertical position indicates the 'primitiveness' of the genera. The 'primitiveness' is determined by the number of points awarded for each of the twenty characters listed in table 8, from no points for the 'primitive' condition of a character up to ten points for an 'advanced' condition. The thickness of the lines indicates the relative number of species.

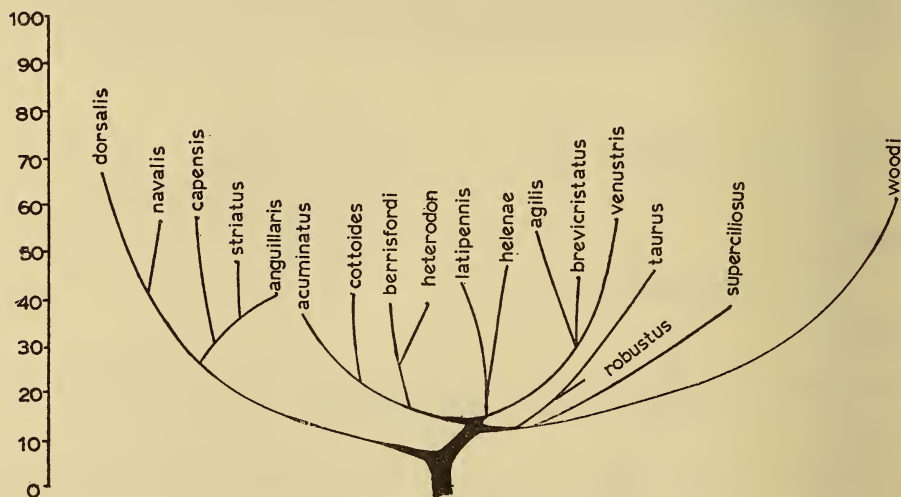


FIG. 46. Hypothetical interspecific relationships of the South African genus *Clinus*.

The two major lines, leading to the genera *Clinus* and *Pavoclinus*, retain a fairly high number of 'primitive' characters, but these are not the same in the two groups; for instance, the supraorbital tentacle is retained in *Clinus* but lost in *Pavoclinus*, whereas the 'primitive' arrangement of the anterior dorsal spines for this group is retained in several of the species of *Pavoclinus*, but in none of the species of *Clinus*. The species of *Pavoclinus* are more specialized for a particular habitat than are the species of *Clinus*.

In the genus *Clinus* there appears to have been a tendency to reduce the height of the anterior dorsal spines. (This tendency is apparently paralleled in the Labrisomini (Hubbs, 1953b).) In those species of *Clinus* in which the anterior dorsal spines are high, the membrane, especially that between the third and fourth dorsal spines, is incised to a greater or lesser degree; this is also

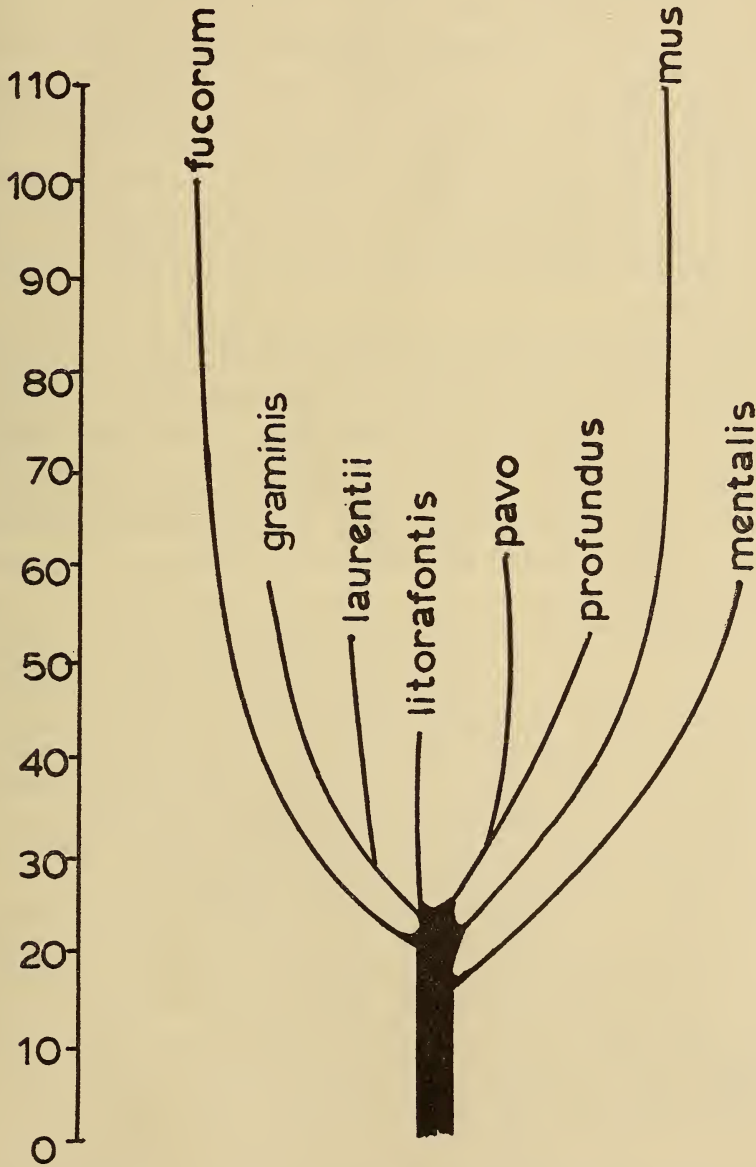


FIG. 47. Hypothetical interspecific relationships of the South African genus *Pavoclinus*.

the case in two species in which the anterior spines are low. In three of the four subgenera (comprising, however, less than one third of the species in the genus) there is a tendency towards elongation of the body and an eel-like habit. These forms are thought to have diverged early from the main branch (see fig. 46, *Clinus anguillar*, *C. striatus*, *C. capensis*, *C. dorsalis* and *C. navalis*). All the species involved show considerable specialization, which would have required a relatively long time, yet retain certain primitive characters such as the facial and supraopercular scales in the subgenus *Blennophis* and the facial scales in the subgenus *Cirrhobarbis*. All the less specialized species of *Clinus* have the head region completely naked, except for *C. woodi*, which retains three supraopercular scales on either side. The tendency to reduction of scaling in the head region has occurred in all the genera of South African Clinini, most of which lack scales on the head, and the scaling of the fin bases has become reduced as well.

Figure 46 shows the hypothetical inter-relationships of the species of *Clinus*. The figure has been drawn up in the same way as figure 45, using the characters listed in table 8.

All the species of the genus *Pavoclinus* are modified for a weed-dwelling habit. The supraorbital tentacle has been lost, and in this feature they are more 'advanced' than the species of *Clinus*, but the arrangement of the dorsal fin in *Pavoclinus graminis*, *P. litorafontis* and *P. pavo* is very similar to that of the species of *Gibbonsia*, and is therefore considered to be primitive. As in the genus *Clinus* there has been a reduction in the extent of the scaling, and in all the species of *Pavoclinus* the head region is entirely naked. The hypothetical relationships of the species are shown in figure 47, which has been drawn up in the same way as figures 45 and 46.

The subgenus *Labroclinus*, containing one species (*Pavoclinus mentalis*), may have diverged fairly early. It retains several 'primitive' features; the fin counts are higher than those in the other subgenera of *Pavoclinus*, being similar to the intermediate fin counts of the *Clinus* (*Clinus*) group of species; the dorsal and caudal fin bases are scaled; the vomer is toothed, and the caudal peduncle is only moderately elongate. On the other hand, it has apparently specialized features such as the complete separation of the dorsal crest and the skinny flap on the lower jaw symphysis. It presumably arose by specialization from a form such as *Pavoclinus laurentii*, which has a separate dorsal crest.

The other two monospecific subgenera, *Fucomimus* and *Smithichthys*, are highly specialized weed-dwellers and retain very few 'primitive' characters. The fin counts are reduced, the scales are minute and do not extend to the median fin bases, the vomer is edentate, and the caudal peduncle is very long. *Pavoclinus* (*Fucomimus*) *mus* has a separate dorsal crest, and a low number of dorsal soft rays; the number of caudal rays is reduced to eleven. *Pavoclinus* (*Smithichthys*) *fuorum* has a peculiar form of crest with at least the first four dorsal spines involved, an upturned snout, and the teeth reduced to one row in each jaw. The lack of vomerine teeth in the subgenera *Fucomimus* and *Smithichthys* is paralleled in the South American genus *Myxodes*, to which the species

Pavoclinus (*Smithichthys*) *fucorum* was referred by Smith (1945).

The remaining species constituting the subgenus *Pavoclinus* form a relatively compact group; in one of the five species the fin membrane is incised between the third and fourth dorsal spines, and in one of the species, *Pavoclinus profundus*, the anterior dorsal spines are low, and the scales are minute.

The three remaining genera are minor groups and have undergone little or no speciation.

Blennioclinus is apparently not close to any of the other genera, but in the character of the anterior part of the lateral line and in the body form and habit resembles *Clinus* rather than *Pavoclinus*. The notch in the profile of the dorsal fin before the dorsal soft rays in this genus is unique in the Clininae, although it commonly occurs in the labrisominid genera *Labrisomus* and *Malacoctenus* (Springer, 1958, pls. I-VII). However, as *Blennioclinus* clearly belongs to the Clininae, it is difficult to see how this character may have developed. In this connexion it is interesting to note that there are various features which appear scattered throughout the clinids in apparently not very closely related forms. Examples are the flap of the skin on the lower jaw symphysis developed in some of the American tribe Paraclinidi, e.g. *Paraclinus barbatus* Springer (Springer, 1954, fig. 1), in *Pavoclinus mentalis* (fig. 29), in *Cancelloxus burrelli* (fig. 44) and in members of the related family Chaenopsidae, e.g. *Chaenopsis alepidota alepidota* (Gilbert) (Stephens, 1963 pl. 12); the reduction of the number of dorsal soft rays to one in the Paraclinidi (Hubbs, 1952) and the subgenera *Climacoporus* and *Muraenoclinus* of the genus *Clinus*; and the development of the hook on the pectoral girdle, so characteristic of the Clininae, in the adults of two Labrisominae, *Malacoctenus erdmani* Smith and *Malacoctenus aurolineatus* Smith (Springer, 1958). I believe that these shared characters are strong evidence for a monophyletic origin of the Clinidae as a whole.

Clinoporus, the most specialized of the five South African genera of Clinini, is apparently most closely related to the genus *Clinus* and may have been derived from the line leading to the eel-like species of *Clinus* by loss of the scales and modifications of the lateral line. Since the single species, *Clinoporus biporosus*, is the only species of the South African Clinini (other than the little-known *Pavoclinus profundus*) that is normally taken in relatively deep water beyond the limits of the infratidal fringe, it might be expected to differ markedly from the predominantly intertidal Clinidae.

Gynutoclinus retains the greatest number of 'primitive' characters, although the peculiar form of the head excludes it from the direct line of descent of any of the other genera. The rarity of its single species suggests that it has not proved as successful in those habitats where it has been taken as at least three of the other four genera; *Clinoporus* is also represented by a single, apparently rare species, but the inaccessibility of the usual habitat of *Clinoporus* may contribute considerably to the impression of rarity.

Gynutoclinus has features in common with both *Pavoclinus* and *Clinus*, but it appears to have followed an independent pattern of evolution. The intro-

mittent organ of the male is similar to the type found in the genus *Clinus*, and there is a vestigial supraorbital tentacle; the characters shared with *Pavoclinus* are chiefly those associated with adaptation to a weed-dwelling existence.

The other subtribe, the Xenopoclinidi, apparently have a common derivation with the Clinidi from a myxodidlike ancestor, and the high degree of

Table 8. Characters used in the consideration of specialization in South African Clinini.

Characters	'Primitive' condition
Presence or absence of scales on body	Scales present
Degree of scaling on head	Scale patches on cheek and above opercle.
Degree of scaling on median fin bases	Scales on dorsal, caudal, and anal fin bases
Arrangement of jaw teeth	A row of small teeth behind front row of jaw teeth
Presence or absence of teeth on vomer	Vomer toothed
Position of dorsal fin origin	Over hind margin of preopercle
Height of anterior dorsal spines	First three dorsal spines higher than succeeding spines
Presence or absence of a notch in membrane between third and fourth dorsal spines	Notch in membrane absent
Number of dorsal spines	30-40
Number of dorsal rays	5-10
Number of anal rays	20-30
Development of third pelvic ray	Stout, equal to other two
Arrangement of posterior part of lateral line	Short separate horizontal tubes with a pore at either end
Arrangement of anterior part of lateral line	Single pores opening more or less medially
Presence or absence of supraorbital tentacle	Supraorbital tentacle present
Shape of head	Compressed, not inflated
Snout shape	Sloping to mouth, not upturned
Presence or absence of facial barbels	Facial barbels absent
Condition of jaw symphysis	Smooth, without projecting skinny flap
Length of caudal peduncle	Short to moderate, 20-40% of head length

specialization of this group suggests that the divergence probably occurred early. It is possible to derive the Xenopoclinidi from a form tending towards elongation of the body such as might have given rise to *Clinoporus* and the eel-like species of *Clinus*.

Note on the geographical origin of the Clininae

As can be seen from figure 1, the Clinidae are a widespread family, occurring in the tropics and the temperate regions of the southern hemisphere. Because the greatest occurrence of the family as a whole is in the tropics of Central America, this region has been considered to be their centre of origin (Hubbs, 1952; Springer, 1958). The South African and Indo-Australian forms are all viviparous and have been considered to have spread to those regions from America some time after the origin of the group; closely related oviparous forms occur in South America. Most of the clinids of the Pacific coast of America and all the clinids except two species of the Atlantic coast of America belong to the apparently more primitive subfamily the Labrisominae. The subtribe Calliclinidi, which Hubbs (1952) considered to be the most primitive of the Labrisominae, is apparently confined to the Pacific coast of South America. The tribe Neoclinini, also primitive but of rather uncertain systematic position, is also confined to the eastern Pacific, with one, or at most a few, representatives in Japan, the Ryukyus and Korea.

It has generally been assumed that the Clininae and the Labrisominae have had a common origin, and this view is supported by the shared features listed in the previous section. However, it is as well to remember that insufficient comparison has been made between the Labrisominae and the Clininae to determine whether either could actually be ancestral to the other; on the whole a common origin from a more primitive group is most probable.

Briggs (1955), following Matthew (1915), considered the centre of origin or 'centre of dispersal' of a group to be that area in which the most progressive species of the group are found, rather than the area where the greatest number of species, regardless of their state of advancement, occur. The most primitive species are then found to have a peripheral distribution about this area.

If the Labrisominae and the Clininae are considered separately, the following emerges: the most progressive Labrisominae undoubtedly occur in the tropical waters of Central America. The Calliclinidi occur on the periphery of this region, in temperate Pacific South American waters. But the most progressive Clininae do not occur in the American region; they occur in the temperate waters of South Africa and Australia. The more primitive Clininae, the Myxodini, the Japanese *flammeus* with its small intromittent organ, and probably the Mediterranean clinid, occur mainly on the periphery of this region. This suggests, then, that the Labrisominae had an Atlanto-East-Pacific origin, whereas the Clininae had an Indo-West-Pacific origin.

Briggs (1955) pointed out that it has been proved for several plant and land animal groups, where there is an extensive fossil record, that their centre

of origin lies far from the area in which their greatest modern occurrence lies. Unfortunately the inadequacy of the Tertiary fish fossil record has made it necessary to rely to a large extent on modern distribution alone. However, there are some indications that the Labrisominae may have originated and undergone at least some radiation in the Tethys Sea before conditions there became unsuitable for a tropical group, and that they then became established and underwent extensive radiation in the Atlanto-East-Pacific while the Pacific and Atlantic coasts of Central America were still in free communication. *Labrisomus nuchipinnis* (Quoy & Gaimard) occurs on the tropical Atlantic coast of America, in the West Indies, the Madeira Islands, the Canary Islands, the Cape Verde Islands and the coast of tropical West Africa as far south as Moçamedes in Angola. *Malacoctenus africanus* (Cadenat) has been recorded from Dakar, Senegal, in West Africa. Arambourg (1921, 1927, 1943), described a fossil species which he called *Labrisomus pronuchipinnis* from the Miocene Tethys deposits of Algeria. He referred it to the relatively small category of Mediterranean fossil species having their main affinities with the fauna of the Atlantic (Arambourg, 1943). Steinitz (1950, q. Hubbs, 1953*b*) believed the occurrence of *Labrisomus nuchipinnis* in West Africa to date from the time of the Tethys Sea. Hubbs (1953*b*) and Springer (1958) disagreed with this view, because they considered that a species could not remain undifferentiated on both sides of the Atlantic for so long a time, and Hubbs (1953*b*) suggested that the fact that *Labrisomus nuchipinnis* apparently has a rather longer pelagic larval stage than is usual for clinids might account for its transport across the Atlantic. However, the species of *Malacoctenus* apparently have a particularly short larval stage (Springer, 1958), so that this would not account for the occurrence of a species of *Malacoctenus* in West Africa, if it is assumed to be derived from the American species of *Malacoctenus*. To explain the occurrence of *Labrisomus pronuchipinnis* in Mediterranean deposits and the occurrence of *Labrisomus nuchipinnis* and *Malacoctenus africanus* in West Africa, we must, if the group is considered to be American in origin, postulate a Tethys crossing for *Labrisomus pronuchipinnis* and two recent crossings for the two modern species. The two recent crossings, at least, are not favoured by the prevailing current systems, although this appears often to be the case in shore fish distribution (Briggs, 1967). Perhaps as far as the Labrisominae are concerned it might be preferable to agree with Steinitz (1950) and to suggest that, although on the whole one would expect genetically isolated populations such as the American and West African *Labrisomus nuchipinnis* to become specifically distinct, *Labrisomus nuchipinnis* is clearly a robust and successful species where it occurs, and it may have had no tendency to undergo any change. This latter is not surprising, since Ekman (1953) pointed out that the West African region is in fact a faunally poor area that few groups have found suitable for extensive radiation. *Labrisomus nuchipinnis* may be the exception that proves the rule regarding isolated populations; whether we regard it as exceptional as regards speciation or exceptional as regards crossing the Atlantic from America to Africa, it remains an exception;

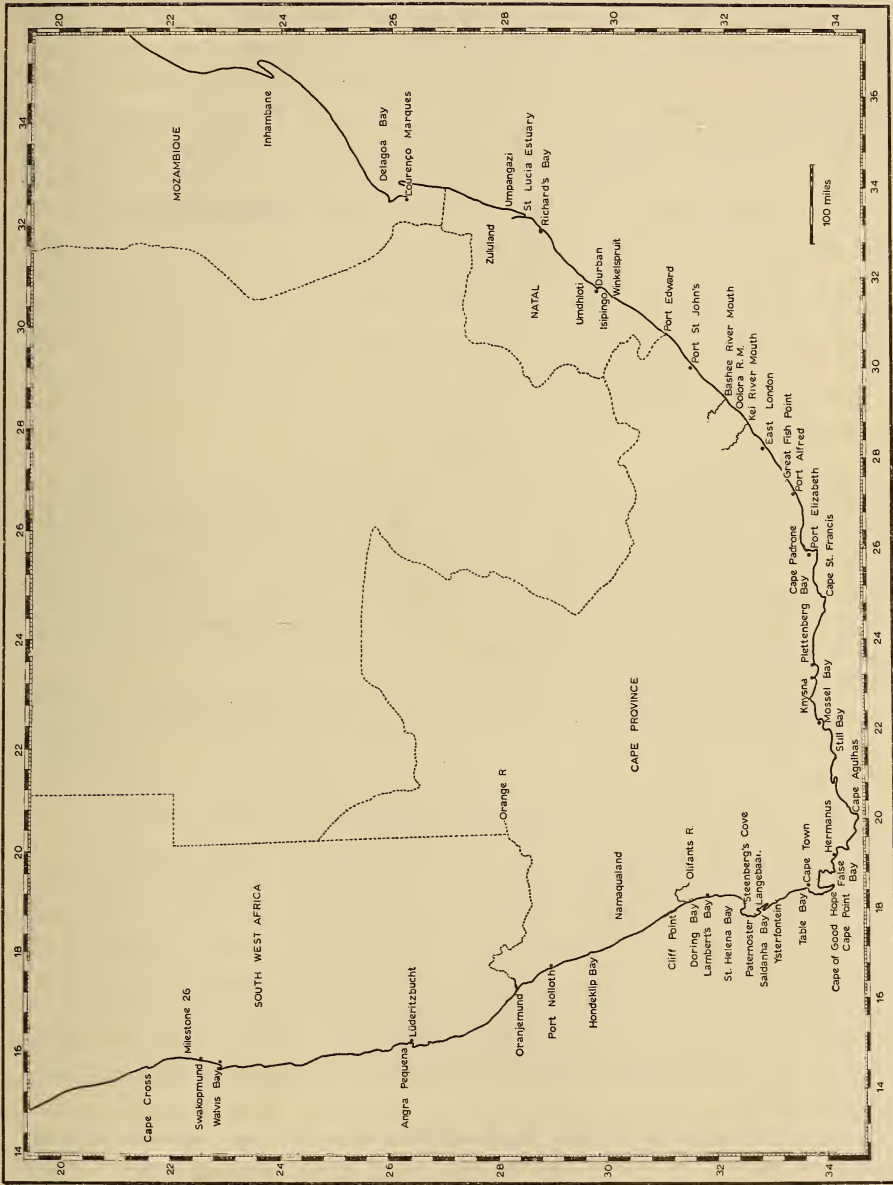


FIG. 48. Map of southern Africa showing the localities referred to in the text. Rocky Point, the northernmost point on the South West African coast at which a clinid was collected, is not shown but it lies 210 miles north of Cape Cross.

at least by adopting the former view *Labrisomus pronuchipinnis* and *Malaccoctenus africanus* do not have to be regarded as similarly exceptional.

It seems possible that the common stock which gave rise to these two sub-families was a tropical Tethys Sea group which, in common with most of the early Tertiary Thethys fauna, died out when climatic conditions changed. Ekman (1953) noted that both the Indo-West-Pacific and the western Atlantic (Atlantic-East-Pacific region) received forms from the Tethys Sea which are now either no longer predominant or are no longer found at all in the Mediterranean or the eastern Atlantic. The Atlanto-East-Pacific would then have received the Labrisominae, already to some extent differentiated, from the Tethys Sea, and these forms would have found this area highly suitable for adaptive radiation. The Clinidi, on the other hand would have become established in the temperate Indo-West Pacific and there undergone adaptive radiation and developed viviparity. The Myxodini may either have reached South America by crossing the eastern Pacific from the Indo-West-Pacific, or may have arisen separately from the viviparous Indo-West-Pacific Clinini. The latter seems more likely; the hook on the pectoral girdle may not indicate as close a relationship as it has been thought to do, since it does appear in two Labrisominae. In any case, if the forerunners of the Clininae were present in the Tethys Sea, it is possible that some migrated to the Indo-West-Pacific and gave rise to the viviparous Clinini, while others, very similar, migrated with the Labrisominae to the Atlanto-East-Pacific and there gave rise to the Myxodini. However, such considerations of the zoogeographical origin of a group are always of a highly speculative character.

The mechanism of such dispersal of virtually sedentary forms, whether now or in Tertiary times, is of course unknown. Ekman (1953) stated that the only conceivable method of dispersal over long distances for forms with a short or no pelagic larval period is by attachment to or entanglement in sea-weed. He cited two cases of wide distribution of viviparous echinoderms which he considered could have occurred in no way other than by transport in sea-weed. One is the brittle-star *Amphipholis squamata* (Della Chiaje), which occurs from the Red Sea to South Africa, Hawaii, the Society Islands and the west coast of America; it also occurs at the southern tip of Patagonia, indicating that it was transported round Cape Horn. It is obviously far more eurythermic than any of the Clinidae. The other is the starfish *Asterina exigua* (Lamarck), endemic to South Africa, which also occurs on the island of St. Helena, where it was apparently carried in drifting material from South Africa by a branch of the Benguela current.

The transport in sea-weed of the ancestor of, for instance, the Australian Clinini from South Africa is quite likely. It would be quite possible for a weed-dwelling clinid to live for a fairly long period of time in a floating mass of weed, provided that the food supply lasted until land was reached, and to become established in the new area if conditions were suitable. Viviparity would favour this type of dispersal, since only one gravid female would be

needed to carry quite a large number of fishes to the new area.

Finally it may be said that there is a modern record of a clinid surviving a long journey when being transported by a ship, although the specimen met with a fate on arrival that precluded its becoming established in the new area.

Clinus navalis (Barnard) was first described from a specimen recovered from amongst barnacles on a ship's bottom at Simonstown in False Bay, Cape Peninsula, some two hundred miles west of the western limit of the range of the species, and some five hundred miles west of the last port where it could have been picked up. It was apparently found in good health.

I am not suggesting that this example can be used to explain the distribution of, for instance, the West African clinids, since their existence in Africa obviously antedates regular ship crossings; the example is merely given to show that clinids can survive passive transport at least over a short period, by ships, and the underside of ships, discharging oil, etc., might be considered to be a less hospitable environment than a free-floating raft of weed.

SUMMARY

This work consists of a systematic revision of the South African Clinidae. The relationships of the South African Clinidae with the Clinidae of other parts of the world are briefly considered. Classification of the South African Clinidae above the generic level is revised, and the several South African clinid species are regrouped in seven genera, which arrangement seems to reflect the natural relationships within the group better than the previous assemblage of small genera. The family Xenopoclinidae Smith, 1961 is included in the family Clinidae. Some comment is made on the evolution and zoogeography of the Clinidae.

ACKNOWLEDGEMENTS

I am grateful to the council for Scientific and Industrial Research for a grant which supported me for part of the time during which this research was undertaken, and to the Council for Scientific and Industrial Research and the South African National Committee for Oceanographic Research for grants towards collecting expeditions.

I am indebted to Dr. N. A. H. Millard of the Zoology Department, University of Cape Town, for helpful criticism and guidance throughout this work; to Dr. V. G. Springer of the Division of Fishes, Smithsonian Institution, United States National Museum, for many helpful suggestions and valuable criticisms of the manuscript, as well as much useful comparative material; to Dr. F. H. Talbot of the Australian Museum, Sydney, and formerly of the South African Museum, for much help in the initial stages of the project; to the late Professor J. L. B. Smith and to Mrs. M. M. Smith of the Ichthyology Department, Rhodes University, and Professor J. H. Day of the Zoology Department, University of Cape Town, for helpful discussions.

I am grateful to the South West African Administration and in particular Mr. C. G. Coetzee, Director of the State Museum, Windhoek, for making it possible for me to collect on the South West African coast between Rocky Point and the Kunene River Mouth, and for giving me every assistance in the collecting.

I am indebted to the following individuals for placing specimens in existing collections at my disposal, or where this was not possible, examining specimens for me: the late Professor J. L. B. Smith (Ichthyology Department, Rhodes University), Dr. M. L. Bauchot (Muséum National d'Histoire Naturelle, Paris), Mr. A. Wheeler (British Museum of Natural History), Dr. V. G. Springer (Smithsonian Institution, United States National Museum), Professor J. H. Day (University of Cape Town), Dr. F. H. Talbot (Australian Museum, Sydney), Dr. Y. Tominaga (Misaki Marine Biological Station, Japan), and Dr. J. E. Böhlke (Academy of Natural Sciences, Philadelphia).

Many people assisted by collecting and donating specimens for this project; I am indebted particularly to the late Prof. J. L. B. Smith, Misses G. G. Jones, S. C. Penrith, R. M. Tietz and Messrs. C. D. Berrisford, D. H. Eccles, N. R. Fuller, S. X. Kannemeyer, B. F. Kensley, P. Pretorius for help with collections and donation of material.

I am especially indebted to my husband, Mr. M. J. Penrith, of the Oceanography Department, University of Cape Town, who collected most of the material for this project, and gave much valuable advice and help in the preparation of the manuscript.

The Trustees of the South African Museum thank the South African Council for Scientific and Industrial Research for a grant in aid of publication.

This work formed part of a thesis submitted for the degree of Ph.D. at the University of Cape Town in October 1965.

REFERENCES

- AL-UTHMAN, H. S. 1960. Revision of the Pacific forms of the tribe Starksiiidi. *Tex. J. Sci.* **12**: 163-175.
- ARAMBOURG, C. 1921. Sur la faune ichtyologique d'Oran. *C. r. hebd. Séanc. Acad. Sci., Paris* **172**: 1232-1245.
- ARAMBOURG, C. 1927. Les poissons fossiles d'Oran. *Matér. Carte géol. Algér.* (Paléont.) **6**: 1-298.
- ARAMBOURG, C. 1943. Sur la distribution mésogéenne de quelques poissons actuels et fossiles. *C. r. hebd. Séanc. Acad. Sci., Paris* **217**: 462-464.
- BARNARD, K. H. 1927. A monograph of the marine fishes of South Africa. *Ann. S. Afr. Mus.* **21**: 419-1065.
- BARNARD, K. H. 1935. Notes on South African marine fishes. *Ann. S. Afr. Mus.* **30**: 645-658.
- BARNARD, K. H. 1937. Further notes on South African marine fishes. *Ann. S. Afr. Mus.* **32**: 41-67.
- BARNARD, K. H. 1948. Further notes on South African marine fishes. *Ann. S. Afr. Mus.* **36**: 341-404.
- BEAUFORT, L. F. DE & CHAPMAN, W. M. 1951. *The fishes of the Indo-Australian archipelago. IX. Percomorphi (concluded), Blennioidea.* Leiden: Brill.
- BEEBE, W. & TEE-VAN, J. 1928. The fishes of Port-au-Prince Bay, Haiti. *Zoologica, N.Y.* **10**: 1-279.
- BEEBE, W. & TEE-VAN, J. 1934. A new genus and species of scaleless blenny, *Somersia furcata*, from Bermuda. *Am. Mus. Novit.* **730**: 1-3.

- BERG, C. 1898. Comunicaciones ictiológicas. *Comun. Mus. nac. Buenos Aires* **1**: 9-13.
- BLEEKER, P. 1860. Over eenige vischsoorten van de Kaap de Goede Hoop. *Natuurk. Tijdschr. Ned.-Indië* **21**: 49-80.
- BLOCH, M. E. & SCHNEIDER, J. G. 1801. *Systema ichthyologia iconibus ex illustratum. Post obitum auctoris onus inchoatum absolvit, correxit, interpolavit Johann Gottlob Schneider*. Berolini.
- BÖHLKE, J. E. 1957. A review of the blenny genus *Chaenopsis* and a description of a related genus from the Bahamas. *Proc. Acad. nat. Sci. Philad.* **109**: 25-57.
- BÖHLKE, J. E. & SPRINGER, V. G. 1961. A review of the Atlantic species of the clinid fish genus *Starksia*. *Proc. Acad. nat. Sci. Philad.* **113**: 29-60.
- BRIGGS, J. C. 1955. A monograph of the clingfishes (order Xenopterygii). *Stanford ichthyol. Bull.* **6**: 1-224.
- BRIGGS, J. C. 1967. Dispersal of tropical marine shore animals: Coriolis parameters or competition? *Nature, Lond.* **216**: 350.
- BUEN, F. DE. 1962. Fauna chilena. Peces de la familia Clinidae. *Montemar* **2**: 53-96.
- CADENAT, J. 1950. Poissons de mer du Sénégal. *Init. afr.* **3**: 1-345.
- CALDWELL, D. K. 1954. Additions to the known fish fauna in the vicinity of Cedar Key, Florida. *Q. J. Fla. Acad. Sci.* **17**: 182-184.
- CASTELNAU, F. L. 1860. Note sur les poissons de l'Afrique australe. *C. r. hebdom. Séanc. Acad. Sci., Paris* **50**: 788-789.
- CASTELNAU, F. L. 1861. *Mémoire sur les poissons de l'Afrique australe*. Paris: Baillière.
- CUVIER, G. L. C. F. D. 1817. *Le règne animal distribué d'après son organisation*. **2**. Poissons. Paris: Fortin, Masson.
- CUVIER, G. L. C. F. D. & VALENCIENNES, A. 1836. *Histoire naturelle des poissons*. **11**. Paris: Levrault.
- DAWSON, C. 1960. *Starksia ocellata*, a new sponge inquiline from South Carolina. *Copeia* **1960**: 75.
- DAY, J. H. 1967. The biology of Knysna estuary, South Africa. *Estuaries* **1967**: 397-407.
- DAY, J. H., MILLARD, N. A. H. & HARRISON, A. D. 1952. The ecology of South African estuaries. Part III: Knysna, a clear open estuary. *Trans. R. Soc. S. Afr.* **33**: 367-413.
- DELFIN, F. T. 1898-1901. Catalogo de los peces de Chile. *Rvta chil. Hist. nat.* **3**: 95-99.
- EKMAN, S. 1953. *Zoogeography of the sea*. London: Sidgwick & Jackson.
- EVERMANN, B. W. & MARSH, M. C. 1900. Descriptions of new genera and species of fishes from Puerto Rico. *Rep. U.S. Commnr. Fish.* **25**: 351-362.
- FORD, R. F. 1959. *A study of the major classification of blennioid fishes based upon cranial nerve evidence*. Thesis submitted for degree of M.A. (Department of Biological Sciences, Stanford University.)
- FOWLER, H. W. 1931. Fishes obtained by the Barber Asphalt Company in Trinidad and Venezuela in 1930. *Proc. Acad. nat. Sci. Philad.* **83**: 391-410.
- FOWLER, H. W. 1934. Fishes obtained by Mr. H. W. Bell-Marley chiefly in Natal and Zululand in 1929-1932. *Proc. Acad. nat. Sci. Philad.* **86**: 485-514.
- FOWLER, H. W. 1942. A list of fishes known from the coast of Brazil. *Archos Zool. Est. S. Paulo* **3**: 115-184.
- FOWLER, H. W. 1944. Results of the Fifth George Vanderbilt Expedition (1941) . . . The fishes. *Monogr. Acad. nat. Sci. Philad.* **6**: 57-529.
- FOWLER, H. W. 1947. Notes on Bahama fishes obtained by Mr. Charles G. Chaplin in 1947, with descriptions of two new species. *Notul. Nat.* **190**: 1-14.
- FOWLER, H. W. 1950. Results of the Catherwood-Chaplin West Indies Expedition, 1948. Part III. The fishes. *Proc. Acad. nat. Sci. Philad.* **182**: 69-93.
- FOWLER, H. W. 1953. On a collection of fishes made by Dr. Marshall Laird at Norfolk Island. *Trans. R. Soc. N.Z.* **81**: 257-267.
- GARMAN, S. 1899. Reports on an exploration off the west coasts of Mexico, Central and South America, and off the Galapagos Islands, in charge of Alexander Agassiz, by the U.S. Fish Commission steamer 'Albatross', during 1891. XXVI. The fishes. *Mem. Mus. comp. Zool. Harv.* **24**: 1-431.
- GILBERT, C. M. 1900. Results of the Branner-Agassiz Expedition to Brazil. *Proc. Wash. Acad. Sci.* **2**: 161-184.
- GILCHRIST, J. D. & THOMPSON, W. W. 1908. The Blenniidae of South Africa. *Ann. S. Afr. Mus.* **6**: 97-142.
- GILL, T. 1860. Monograph of the genus *Labrosomus* Swainson. *Proc. Acad. nat. Sci. Philad.* **12**: 102-108.
- GOSLINE, W. A. 1968. The suborders of perciform fishes. *Proc. U.S. natn. Mus.* **124**: 1-78.

- GRAY, J. E. 1854. *Catalogue of the fish collected and described by Laurence Theodore Gronov, now in the British Museum*. London: Woodfall & Kinder.
- GREENWOOD, P. H., ROSEN, D. E., WEITZMAN, S. H. & MYERS, G. S. 1966. Phyletic studies of teleostean fishes, with a provisional classification of living forms. *Bull. Am. Mus. nat. Hist.* **131**: 341-456.
- GRIFFIN, L. T. 1926. Description of New Zealand fishes. *Trans. Proc. N.Z. Inst.* **56**: 538-546.
- GUILLET, F. 1893. Observations sur les mœurs de trois Blenniidae, *Clinus argentatus*, *Blennius montagai* et *Blennius sphynx*. *Archs. Zool. exp. gén.* (3) **1**: 325-384.
- GÜNTHER, A. 1861. *Catalogue of the acanthopterygian fishes in the British Museum*. **3**. London: British Museum.
- HERRE, A. W. 1936. Notes on the fishes in the zoological museum of Stanford University. V. New or rare Philippine fishes from the Herre 1933 Philippine Expedition. *Philipp. J. Sci.* **59**: 357-382.
- HERRE, A. W. 1939. The Philippine blennies. *Philipp. J. Sci.* **70**: 315-372.
- HILDEBRAND, S. F. 1946. A descriptive catalog of the shore fishes of Peru. *Bull. U.S. natn. Mus.* **189**: 1-530.
- HUBBS, C. 1952. A contribution to the classification of the blennioid fishes of the family Clinidae, with a partial revision of the eastern Pacific forms. *Stanford ichthyol. Bull.* **4**: 41-165.
- HUBBS, C. 1953a. Revision and systematic position of the blennioid fishes of the genus *Neoclinus*. *Copeia* **1953**: 11-23.
- HUBBS, C. 1953b. Revision of the eastern Pacific fishes of the clinid genus *Labrisomus*. *Zoologica, N.Y.* **38**: 113-136.
- HUXLEY, J. S. (ed.) 1940. *The new systematics*. Oxford: Oxford University Press.
- INGER, R. F. 1958. Comments on the definition of genera. *Evolution, N.Y.* **12**: 370-384.
- INTERNATIONAL TRUST FOR ZOOLOGICAL NOMENCLATURE, 1961. *International code of zoological nomenclature adopted by the XV International Congress of Zoology, London, July 1958*. London: The Trust for the International Commission on Zoological Nomenclature.
- INTERNATIONAL TRUST FOR ZOOLOGICAL NOMENCLATURE, 1964. *International code of zoological nomenclature adopted by the XV International Congress of zoology, London, July 1958*. London: The Trust for the International Commission on Zoological Nomenclature.
- JACKSON, P. B. N. 1950. *The fishes of the intertidal zone of the Cape Peninsula*. Thesis for the degree of M.Sc. (Zoology Department, University of Cape Town).
- JORDAN, D. S. 1887. Description of two new species of fishes from South America. *Proc. Acad. nat. Sci. Philad.* **39**: 387-388.
- JORDAN, D. S. & STARKS, E. C. 1906. List of fishes collected on Tanegu and Yaku, offshore islands of southern Japan, by Robert Van Vleck Anderson, with descriptions of seven new species. *Proc. U.S. natn. Mus.* **30**: 695-706.
- KLAUSEWITZ, W. 1958. Fische aus dem Atlantik und Pasifik. *Senckenberg. biol.* **39**: 57-84.
- KNER, R. 1865-7. *Reise österreichischen Fregatte 'Novara' um die Erde in den Jahren 1857-1859, unter den Befehlen des Commodore B. von Wüllerstorff-Urbair*. Zoologischer Theil, Fische. Wien: K.K. Hof-u. Staatsdruckerei.
- LACÉPÈDE, B. G. E. DE. 1800. *Histoire naturelle des poissons*. **2**. Paris: Plasson.
- LICHTENSTEIN, M. H. C. 1823. *Verzeichniss der Doubletten des zoologischen Museums der Königl. Universität zu Berlin, nebst Beschreibung vieler bisher unbekannter Arten von Säugethieren, Vögeln, Amphibien und Fischen*. Berlin: Trautwein.
- LINNAEUS, C. 1758. *Systema naturae* . . . Editio decima, reformata. **1**. Holmiae.
- MAKUSHOK, V. M. 1958. The morphology and classification of the northern blennioid fishes (Stichaeidae, Blennioidei, Pisces). *Trudy. zool. Inst. Akad. Nauk. S.S.S.R.* **25**: 3-129. (Translation by A. Gosline, U.S. National Museum, April 1959).
- MCCULLOCH, A. R. 1908. Studies on Australian fishes. *Rec. Aust. Mus.* **7**: 36-43.
- MCCULLOCH, A. R. 1915. Notes on, and descriptions of, Australian fishes. *Proc. Linn. Soc. N.S.W.* **40**: 259-277.
- MCCULLOCH, A. R. 1922. The fishes and fish-like animals of New South Wales. *Aust. Zool.* **2**: 86-130.
- MCCULLOCH, A. R. 1929. A check-list of the fishes recorded from Australia. *Mem. Aust. Mus.* **5**: 1-534.
- MCLEAY, W. 1882. Descriptive catalogue of the fishes of Australia, part 3. *Proc. Linn. Soc. N.S.W.* **6**: 1-138.

- MARSHALL, T. C. 1957. Ichthyological notes. *Ichthyol. Notes Qd* **1**: 117-137.
- MATTHEW, W. D. 1915. Climate and evolution. *Ann. N.Y. Acad. Sci.* **24**: 171-318.
- MEAD, G. W. 1958. A catalog of the type specimens of fishes formerly in the collection of the Department of Tropical Research, New York Zoological Society. *Zoologica, N.Y.* **43**: 131-134.
- METZELAAR, J. 1922. On a collection of marine fishes from the Lesser Antilles. *Bijdr. Dierk. Feestnummer*: 133-141.
- MILWARD, N. E. 1967. The Clinidae of Western Australia (Teleostei, Blennioidae). *J. Proc. R. Soc. West. Aust.* **50**: 1-9.
- MORROW, J. E. 1957. Shore and pelagic fishes from Peru, with new records and the description of a new species of *Sphaeroides*. *Bull. Bingham oceanogr. Coll.* **16**: 5-55.
- Ogilby, J. D. 1886. Descriptions of new fishes from Port Jackson. *Proc. Linn. Soc. N.S.W.* **10**: 225-230.
- OLSEN, A. M. 1958. New fish records and notes on some uncommon Tasmanian species. *Pap. Proc. R. Soc. Tasm.* **92**: 155-159.
- PAPPE, L. 1853. *Synopsis of the edible fishes at the Cape of Good Hope*. Cape Town: Van de Sandt de Villiers & Tier.
- PARR, A. E. 1930. Teleostean shore and shallow-water fishes from the Bahamas and Turks Island. *Bull. Bingham oceanogr. Coll.* **3**: 1-148.
- PENRITH, M.-L. 1965a. Studies on the South African Clinidae. I. Description of a new species of *Pavoclinus*, and redescription of *Gynutoclinus rotundifrons* (Barnard). *Ann. S. Afr. Mus.* **48**: 211-217.
- PENRITH, M.-L. 1965b. Note on an extension of the known ranges of distribution of some species of Clinidae (Pisces). *S. Afr. J. Sci.* **61**: 423-424.
- PENRITH, M.-L. 1967. Studies on the South African Clinidae. II. Two new species of the genus *Clinus* from the western Cape. *Ann. S. Afr. Mus.* **50**: 43-59.
- ROSENBLATT, R. H. 1963. Speciation in marine shore fishes. In Harding, J. P. & Tebble, N., eds. *Speciation in the sea*: 171-180. London: Systematics Association.
- ROSENBLATT, R. H. & WALKER, B. W. 1963. The marine fishes of the Galapagos Islands. *Occ. Pap. Calif. Acad. Sci.* **44**: 97-104.
- SCHULTZ, L. P. 1949. A further contribution to the ichthyology of Venezuela. *Proc. U.S. natn. Mus.* **99**: 1-211.
- SCOTT, E. O. G. 1935. Observations on some Tasmanian fishes. Part II. *Pap. Proc. R. Soc. Tasm.* **1934**: 63-73.
- SCOTT, E. O. G. 1939. Observations on some Tasmanian fishes. Part IV. *Pap. Proc. R. Soc. Tasm.* **1938**: 139-159.
- SCOTT, E. O. G. 1955. Observations on some Tasmanian fishes. Part VII. *Pap. Proc. R. Soc. Tasm.* **89**: 131-146.
- SMITH, C. L. 1957. Two new clinid blennies (*Malacoctemus*) from Puerto Rico. *Occ. Pap. Mus. Zool. Univ. Mich.* **585**: 1-15.
- SMITH, J. L. B. 1931. New fishes from South Africa. *Rec. Albany Mus.* **4**: 145-160.
- SMITH, J. L. B. 1935. New and little-known fishes from South Africa. *Rec. Albany Mus.* **4**: 169-235.
- SMITH, J. L. B. 1937. New records of South African fishes. *Ann. Natal Mus.* **8**: 167-197.
- SMITH, J. L. B. 1945. The fishes of the family Clinidae in South Africa. *Ann. Mag. nat. Hist.* (11) **12**: 535-546.
- SMITH, J. L. B. 1947a. Brief revisions and new records of South African marine fishes. *Ann. Mag. nat. Hist.* (11) **14**: 335-346.
- SMITH, J. L. B. 1947b. New clinid fishes from South Africa. *Ann. Mag. nat. Hist.* (11) **14**: 732-736.
- SMITH, J. L. B. 1949. *The sea fishes of southern Africa*. Cape Town: Central News Agency.
- SMITH, J. L. B. 1953. *The sea fishes of southern Africa*. Rev. ed. Cape Town: Central News Agency.
- SMITH, J. L. B. 1960. A new species of South African clinid fish. *Ann. Mag. nat. Hist.* (13) **3**: 689-691.
- SMITH, J. L. B. 1961. Fishes of the family Xenopoclinidae. *Ichthyol. Bull. Rhodes Univ.* **20**: 351-356.
- SMITH, J. L. B. 1962. Fishes from the Cape described by Lichtenstein in 1823. *S. Afr. J. Sci.* **58**: 39-40.
- SMITH, J. L. B. 1966. Certain rare fishes from South Africa with other notes. *Occ. Pap. Dept. Ichthyol. Rhodes Univ.* **7**: 65-80.
- SPRINGER, V. G. 1954. Western Atlantic fishes of the genus *Paraclinus*. *Tex. J. Sci.* **6**: 422-441.

- SPRINGER, V. G. 1955. The taxonomic status of the fishes of the genus *Stathmonotus*, including a review of the Atlantic species. *Bull. mar. Sci. Gulf Caribb.* 5: 66-80.
- SPRINGER, V. G. 1958. Systematics and zoogeography of the clinid fishes of the subtribe Labrisomini Hubbs. *Publs Inst. mar. Sci. Univ. Tex.* 5: 418-491.
- SPRINGER, V. G. 1964. A review of: A revised classification of the blennioid fishes of the American family Chaenopsidae by J. S. Stephens, Jr. 1963. *Copeia* 1964: 591-593.
- SPRINGER, V. G. 1966. *Medusablennius chani*, a new genus and species of blennioid fish from the Tuamotu Archipelago: its implication on blennioid classification. *Copeia* 1966: 56-60.
- SPRINGER, V. G. 1968. Osteology and classification of the fishes of the family Blenniidae. *Bull. U.S. natn. Mus.* 284: 1-85.
- STARKS, E. C. 1913. The fishes of the Stanford Expedition to Brazil. *Leland Stanford jr Univ. Publs Univ. Ser.* 12: 1-77.
- STEINITZ, H. 1950. On the zoogeography of the teleostean genera *Salarias*, *Ophioblennius* and *Labrisomus*. *Archo zool. ital.* 35: 325-348. (Not seen).
- STEPHENS, J. S. Jr. 1961. Range extension of the temperate blennioid fish, *Neoclinus bryope*, into the tropical western Pacific. *Copeia* 1961: 484-485.
- STEPHENS, J. S. Jr. 1963. A revised classification of the blennioid fishes of the American family Chaenopsidae. *Univ. Calif. Publs Zool.* 68: 1-133.
- SUZUKI, K. 1964. Results of the Amami Expedition. II. Fishes. *Rep. Fac. Fish. Univ. Mie* 5: 153-188.
- SWAIN, J. 1882. A review of Swainson's genera of fishes. *Proc. Acad. nat. Sci. Philad.* 34: 272-284.
- SWAINSON, W. 1839. The natural history and classification of fishes, amphibians and reptiles, or monocardian animals. In *The Cabinet Encyclopaedia*. 8. London: Longman, Orme, Brown, Green & Longmans.
- THOMPSON, W. W. 1918. Catalogue of the fishes of the Cape Province. *Mar. biol. Rep. Cape Tn* 4: 75-177.
- WHITLEY, G. P. 1929. Johnston's memoranda relating to the fishes of Tasmania. *Pap. Proc. R. Soc. Tasm.* 1928: 44-69.
- WHITLEY, G. P. 1945. New sharks and fishes from Western Australia. *Aust. Zool.* 11: 1-42.
- WHITLEY, G. P. 1956. Ichthyological notes. *Aust. Zool.* 12: 251-261.
- WHITLEY, G. P. 1959. Ichthyological snippets. *Aust. Zool.* 12: 310-323.

APPENDIX A. Data for fig. 3 (comparison of upper jaw lengths of South African Clinidi).
(Data as % of head length.)

				Std. dev.	Std. err.	Std. err.	No. of fish
		Range	Mean	σ	sm	$\times 2$ $2sm$	N
<i>Clinus anguillar</i>	.. ..	36.3-43.0	40.0	0.35	0.07	0.14	25
<i>Clinus striatus</i>	.. ..	37.0-44.5	40.2	—	—	—	9
<i>Clinus capensis</i>	.. ..	37.8-47.5	43.7	2.48	0.51	1.02	25
<i>Clinus dorsalis</i>	.. ..	34.8-50.0	40.1	3.63	0.74	1.48	25
<i>Clinus navalis</i>	.. ..	38.0-44.5	40.7	—	—	—	5
<i>Clinus acuminatus</i>	.. ..	35.7-45.5	40.2	2.53	0.52	1.04	25
<i>Clinus agilis</i>	.. ..	40.0-50.0	44.2	2.46	0.52	1.04	25
<i>Clinus berrisfordi</i>	.. ..	36.4-50.0	43.3	3.94	1.02	2.04	16
<i>Clinus brevicristatus</i>	.. ..	38.5-46.5	41.7	1.70	0.36	0.72	23
<i>Clinus cottoides</i>	.. ..	43.7-60.0	49.1	4.17	0.85	1.70	25
<i>Clinus helenae</i>	.. ..	39.5-52.5	44.3	—	—	—	3
<i>Clinus latipennis</i>	.. ..	34.5-43.5	39.3	—	—	—	3
<i>Clinus heterodon</i>	.. ..	36.4-50.0	44.2	4.26	0.87	1.74	25
<i>Clinus robustus</i>	.. ..	45.5-53.5	49.4	—	—	—	8
<i>Clinus superciliosus</i>	.. ..	33.3-45.0	41.2	2.85	0.58	1.16	25
<i>Clinus taurus</i>	.. ..	38.1-53.0	44.4	4.36	0.97	1.94	19
<i>Clinus venustris</i>	.. ..	35.3-48.0	41.2	3.92	0.82	1.64	25
<i>Clinus woodi</i>	.. ..	48.0-51.5	49.8	—	—	—	5
<i>Pavoclinus mus</i>	.. ..	26.7-37.5	29.8	2.24	0.46	0.92	25
<i>Pavoclinus graminis</i>	.. ..	27.6-38.6	33.0	2.45	0.51	1.02	25

<i>Pavoclinus laurentii</i>	..	..	36.0-41.0	39.0	1.39	0.40	0.80	12
<i>Pavoclinus litorafontis</i>	..	..	33.3-42.5	37.9	2.11	0.45	0.86	22
<i>Pavoclinus mentalis</i>	..	..	35.0-40.5	37.0	—	—	—	6
<i>Pavoclinus pavo</i>	..	..	22.0-43.0	32.6	4.36	0.89	1.78	25
<i>Pavoclinus profundus</i>	..	..	36.4	36.4	—	—	—	1
<i>Pavoclinus fucorum</i>	..	..	32.4-42.0	38.3	—	—	—	8
<i>Blennioclinus brachycephalus</i>	..	..	28.6-36.1	32.4	2.06	0.42	0.84	25
<i>Blennioclinus stella</i>	..	..	37.5-47.5	42.2	—	—	—	5
<i>Clinoporus biporosus</i>	..	..	34.1-43.0	38.3	—	—	—	6
<i>Gynutoclinus rotundifrons</i>	..	..	40.0-43.5	42.0	—	—	—	3